MOUNTAIN PINE BEETLE

IN THE PACIFIC NORTHWEST 1955-1966

MOUNTAIN PINE BEETLE DAMAGE in the PACIFIC NORTHWEST 1955-1966

by

Robert E. Dolph, Jr.
Insect and Disease Control Branch
Division of Timber Management
Pacific Northwest Region
U.S. Forest Service
U.S. Department of Agriculture

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INTRODUCTION

The mountain pine beetle *Dendroctonus ponderosae* Hopk. = *D. monticolae* Hopk.[1] is an important tree killer in the Pacific Northwest. Each year this beetle kills pine trees of all ages and in some years may cause serious stand depletion. Between 1955 and 1966, a total of 4,213,600 acres of pine was infested (table 1). The estimated volume loss during this 12 year period is 485 MM board feet. About 70 percent of this mortality occurred in western white pine stands. Tree killing in lodgepole pine stands accounted for 24 percent of the loss; ponderosa pine, 6 percent; and sugar pine, less than 1 percent.

This report is intended as a reference for land managers and forest pest control personnel.

METHODS

Mountain pine beetle outbreaks in the Pacific Northwest are generally detected from the air during annual aerial survey. Each outbreak is classified either light, moderate, heavy or very heavy as determined by the number of dead trees per section, and the number of trees per group. The classification of intensity and grouping of damage per section is presented for each host in the text.

The data from 1955-1966 were compiled from the annual Forest Insect Conditions Reports. These data are summarized by host species, States, and the various reporting areas as shown on the map on the outside back cover.

The volume estimates are based upon an average size tree infested for each major host. The average board foot per acre factor was calculated by multiplying the average board foot per tree by the maximum number of dead trees per section for each intensity class and divided by 640 acres. These intensity classes are listed in the text for each host.

The four infestation maps illustrate the total number of years mountain pine beetle was active in a township between 1955 and 1966. This 12-year period was arbitrarily divided into 3 periods of 4 years each

HOSTS

The major hosts in the Pacific Northwest are lodgepole, ponderosa, western white, and sugar pines.

During epidemic conditions, a few beetles may attack another species of pine or other species such as Engelmann spruce, white fir, Douglas-fir and western hemlock. These attacks often abort or the broods seldom complete their life cycles.

[1] Wood, S. L. A revision of the bark beetle genus Dendroctonus Erichson (Coleoptera: Scolytidae). Great Basin Naturalist 23(1-2): 1-117, illus.

Table 1.—Summary of mountain pine beetle infestations by hosts in Oregon and Washington 1955-66
(In Acres)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total	
													Acres	*Est. Vol.bd. ft.*
LODGEPOLE PINE:														
Oregon	52,360	52,420	73,920	36,640	34,640	40,080	77,680	65,200	50,220	55,790	94,190	89,390	722,530	98,693,525
Washington	27,240	28,360	5,120	5,920	7,600	6,440	1,520	3,050	17,620	8,770	1,970	80	113,690	16,420,524
Sub-total	79,600	80,780	79,040	42,560	42,240	46,520	79,200	68,250	67,840	64,560	96,160	89,470	836,220	115,114,049
PONDEROSA PINE:														
Oregon	2,060	7,440	640	2,560	4,240	14,560	16,640	3,820	32,220	42,440	109,620	54,230	290,470	25,536,932
Washington	0	0	0	0	6,080	4,740	1,200	1,345	1,155	13,830	31,930	21,730	82,010	8,965,872
Sub-total	2,060	7,440	640	2,560	10,320	19,300	17,840	5,165	33,375	56,270	141,550	75,960	372,480	34,502,804
WESTERN WHITE PINE:														
Oregon	12,160	34,680	29,280	32,160	59,520	31,040	114,380	73,720	67,845	92,700	72,120	71,540	691,145	71,929,338
Washington	81,120	130,180	102,560	190,880	153,340	210,400	291,760	349,770	410,545	175,990	127,330	74,410	2,298,285	262,210,088
Sub-total	93,280	164,860	131,840	223,040	212,860	241,440	406,140	423,490	478,390	268,690	199,450	145,950	2,989,430	334,139,426
SUGAR PINE:														
Oregon	0	0	160	0	0	480	0	160	0	6,160	6,110	2,370	15,440	1,477,256
Sub-total	0	0	160	0	0	480	0	160	0	6,160	6,110	2,370	15,440	1,477,256
TOTAL:														
Oregon	66,580	94,540	104,000	71,360	98,400	86,160	208,700	142,900	150,285	197,090	282,040	217,530	1,719,585	197,637,051
Washington	108,360	158,540	107,680	196,800	167,020	221,580	294,480	354,165	429,320	198,590	161,230	96,220	2,493,985	287,596,484
REGIONAL TOTAL	174,940	253,080	211,680	268,160	265,420	307,740	503,180	497,065	579,605	395,680	443,270	313,750	4,213,570	485,233,535

LODGEPOLE PINE

History

Large mountain pine beetle outbreaks developed periodically in lodgepole pine stands throughout the Pacific Northwest. The first major outbreak reported was in 1908 near Joseph, Oregon, on the Wallowa National Forest. Control was directed against this outbreak, making it the first project in the Pacific Northwest. Since that time, many other outbreaks have been reported, primarily in the Cascade Mountains in Oregon. Since 1925, extensive tree killing occurred periodically in and near Crater Lake National Park. A large outbreak was detected on the Deschutes National Forest between Wanoga Butte and Swampy Lakes in the late 1940's. This outbreak did not subside until the late 1950's. The most recent outbreak developed on the Fremont and Winema National Forests near Bald Mountain Lookout in 1962 and losses are still occurring.

Damage Classification

The intensity classification and the estimated board foot per acre used when mapping mountain pine beetle infestations in lodgepole pine during aerial surveys is:

Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — *Number* — —		*Bd. ft./acre*
Light	50-350	50 or less	31.7
Moderate	350-1,000	200 or less	90.6
Heavy	1,000-2,600	400 or less	235.6
Very heavy	2,600 or more	400 and over	1,161.8

Location of Damage

Most of the damage in the Pacific Northwest has occurred east of the Cascade Mountains (map 1). From 1955 through 1966 a total of 836,220 acres of lodgepole pine was reported infested with an estimated loss of over 115 MM board feet (tables 2 and 3). Eighty-eight percent of the Regional losses occurred in Oregon (figure 1-1). Eighty-two percent of the damage in Oregon was centered on the Deschutes, Fremont, and Winema National Forests (figures 1-2, 1-3). The heaviest tree killing on the Deschutes National Forest occurred in 1955 near Wanoga Butte and again in 1965 near Bearwallow Butte. Heaviest losses on the Fremont National Forest have been in the vicinity of Bald Mountain and Slide Mountain. For the Winema National Forest, the heaviest tree mortality occurred in the Cottonwood drainage and near Teatable Mountain.

Tree killing in Washington has been moderate. About 71 percent of the damage occurred on the Wenatchee, Colville, and Okanogan National Forests (figures 1-4, 1-5). Significant losses also occurred on the Gifford Pinchot National Forest and the Yakima Indian Reservation.

Control Measures

Chemicals have not been recommended for controlling mountain pine beetle in lodgepole pine stands in Region 6. Logging is the only practical method for control. This includes removing all merchantable infested and noninfested trees to as small a diameter as economically possible. The sale area should cover a sufficiently large geographic area so as to completely alter the beetle breeding site inside and outside the existing infestation boundary.

Mountain pine beetle outbreaks in lodgepole pine can be kept to a minimum by maintaining a vigorous healthy stand. This is usually done by shortening the rotation. Many lodgepole pine stands become susceptible to attack at age 80. To help reduce future losses, it is suggested that foresters determine the age of their lodgepole pine stands and log the oldest stands first.

Table 2.—Trend of mountain pine beetle infestations in lodgepole pine in Oregon and Washington by reporting area 1955-66
(In Acres)

Reporting Area[1]	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	26,080	12,680	30,880	13,760	2,800	3,520	9,160	17,730	10,330	9,100	11,930	10,480	158,450
Fremont N.F.	5,600	13,100	17,440	9,120	10,400	20,120	25,280	18,120	13,390	21,950	47,100	38,380	240,000
Malheur N.F.	2,440	5,600	2,720	160	1,280	440	960	1,450	610	2,060	8,410	4,540	30,670
Ochoco N.F.	--	--	--	--	--	--	--	10	--	--	40	--	50
Rogue River N.F.	6,720	8,480	3,200	3,680	4,800	2,880	--	640	360	1,100	--	180	32,040
Siskiyou N.F.	--	--	--	--	--	--	--	--	--	190	80	30	300
Umatilla N.F.	480	960	--	320	1,120	240	--	60	2,025	530	140	670	6,545
Umpqua N.F.	1,920	160	320	--	--	--	2,400	200	2,190	160	--	200	7,550
Wallowa-Whitman N.F.	960	5,600	160	640	2,560	40	160	1,160	2,640	1,440	3,130	4,230	22,720
Willamette N.F.	--	400	--	--	1,600	--	--	--	355	160	--	--	2,515
Winema N.F.	8,160	4,160	18,880	7,040	5,760	9,840	31,960	20,390	17,055	17,100	21,560	29,650	191,555
Crater Lake N.P.	--	1,280	--	960	3,520	3,000	6,400	5,440	1,180	2,000	1,800	1,030	26,610
Warm Springs I.R.	--	--	320	960	800	--	1,360	--	85	--	--	--	3,525
Sub-total	52,360	52,420	73,920	36,640	34,640	40,080	77,680	65,200	50,220	55,790	94,190	89,390	722,530
Washington:													
Colville N.F.	--	--	--	--	--	2,800	--	1,720	4,360	3,540	--	--	12,420
Gifford Pinchot N.F.	--	--	--	--	--	--	--	--	8,960	880	--	--	9,840
Kaniksu N.F.	--	--	--	--	--	480	--	10	600	--	--	--	1,090
Okanogan N.F.	640	3,360	480	640	1,120	960	240	390	1,200	2,170	440	--	11,640
Olympic N.F.	--	320	--	--	--	--	--	--	680	--	80	--	1,080
Snoqualmie N.F.	1,280	2,240	--	--	--	--	--	--	--	--	--	--	3,520
Umatilla N.F.	320	--	--	1,600	640	--	--	10	195	--	50	--	2,815
Wenatchee N.F.	21,760	20,480	2,080	3,040	3,840	1,120	640	800	390	1,800	840	--	56,790
Colville I.R.	800	520	800	480	1,680	480	640	120	480	180	--	--	6,180
Spokane I.R.	--	--	--	--	--	120	--	--	--	--	--	--	120
Yakima I.R.	2,240	1,440	1,760	160	320	480	--	--	755	200	560	80	7,995
Glenwood Dist.	200	--	--	--	--	--	--	--	--	--	--	--	200
Sub-total	27,240	28,360	5,120	5,920	7,600	6,440	1,520	3,050	17,620	8,770	1,970	80	113,690
Regional Total	79,600	80,780	79,040	42,560	42,240	46,520	79,200	68,250	67,840	64,560	96,160	89,470	836,220

[1] N.F., National Forest; I.R., Indian Reservation; N.P., National Park; District, State ownership.

Table 3.—Extent and estimated volume of lodgepole pine killed by the mountain pine beetle in Oregon and Washington by reporting unit 1955-66[1]

Reporting Area[2]	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*
Oregon:										
Deschutes N.F.	71,600	2,269,720	46,600	4,221,960	32,330	7,616,948	7,920	9,201,456	158,450	23,310,084
Fremont N.F.	110,480	3,502,216	68,160	6,175,296	40,900	9,636,040	20,460	23,770,428	240,000	43,083,980
Malheur N.F.	12,180	386,106	8,220	744,732	8,165	1,923,674	2,105	2,445,589	30,670	5,500,101
Ochoco N.F.	40	1,268	--	--	10	2,356	--	--	50	3,624
Rogue River N.F.	16,200	513,540	7,520	681,312	5,120	1,206,272	3,200	3,717,760	32,040	6,118,884
Siskiyou N.F.	300	9,510	--	--	--	--	--	--	300	9,510
Umatilla N.F.	4,350	137,895	2,035	184,371	160	37,696	--	--	6,545	359,962
Umpqua N.F.	3,970	125,849	2,840	257,304	180	42,408	560	650,608	7,550	1,076,169
Wallowa-Whitman N.F.	11,255	356,784	7,625	690,825	3,515	828,134	325	377,585	22,720	2,253,328
Willamette N.F.	1,795	56,902	560	50,736	--	--	160	185,888	2,515	293,526
Winema N.F.	132,050	4,185,985	43,075	3,902,595	12,840	3,025,104	3,590	4,170,862	191,555	15,284,546
Crater Lake N.P.	23,100	732,270	3,510	318,006	--	--	--	--	26,610	1,050,276
Warm Springs I.R.	2,245	71,167	160	14,496	1,120	263,872	--	--	3,525	349,535
Sub-total	389,565	12,349,212	190,305	17,241,633	104,340	24,582,504	38,320	44,520,176	722,530	98,693,525
Washington:										
Colville N.F.	3,670	116,339	2,610	236,466	4,900	1,154,440	1,240	1,440,632	12,420	2,947,877
Gifford Pinchot N.F.	5,360	169,912	840	76,104	3,640	857,584	--	--	9,840	1,103,600
Kaniksu N.F.	770	24,409	320	28,992	--	--	--	--	1,090	53,401
Okanogan N.F.	7,450	236,165	2,990	270,894	1,200	282,720	--	--	11,640	789,779
Olympic N.F.	240	7,608	840	76,104	--	--	--	--	1,080	83,712
Snoqualmie N.F.	1,760	55,792	480	43,488	1,280	301,568	--	--	3,520	400,848
Umatilla N.F.	565	17,911	2,240	202,944	10	2,356	--	--	2,815	223,211
Wenatchee N.F.	19,865	629,721	21,945	1,988,217	11,620	2,737,672	3,360	3,903,648	56,790	9,259,258
Colville I.R.	2,080	65,936	2,500	226,500	1,600	376,960	--	--	6,180	669,396
Spokane I.R.	120	3,804	--	--	--	--	--	--	120	3,804
Yakima I.R.	1,915	60,706	5,000	453,000	960	226,176	120	139,416	7,995	879,298
Glenwood Dist.	200	6,340	--	--	--	--	--	--	200	6,340
Sub-total	43,995	1,394,643	39,765	3,602,709	25,210	5,939,476	4,720	5,483,696	113,690	16,420,524
Regional Total	433,560	13,743,855	230,070	20,844,342	129,550	30,521,980	43,040	50,003,872	836,220	115,114,049

[1] Estimated average tree: 10 in. d.b.h.; 55 ft. tall; 58 bd. ft./tree.
[2] N.F., National Forest; N.P., National Park; I.R., Indian Reservation; District, State ownership.

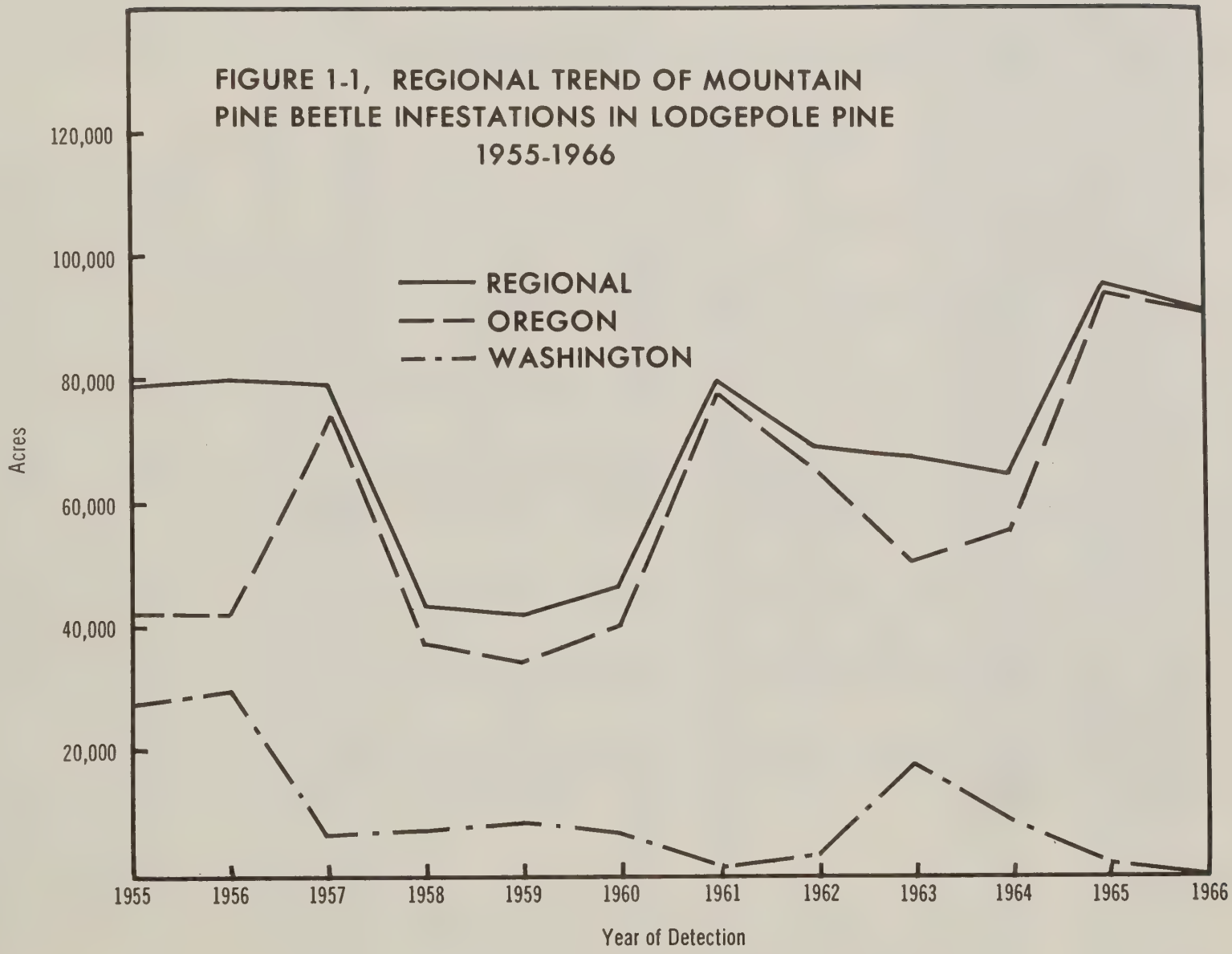
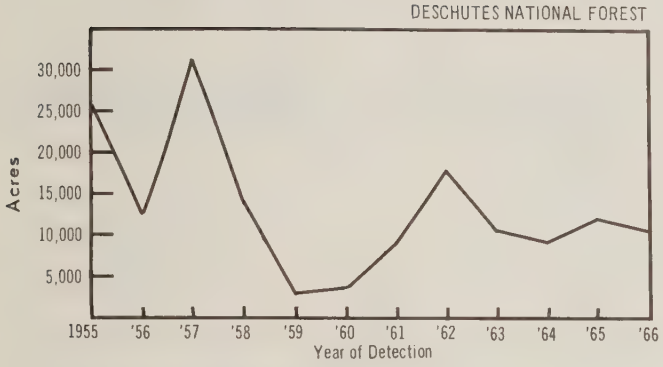
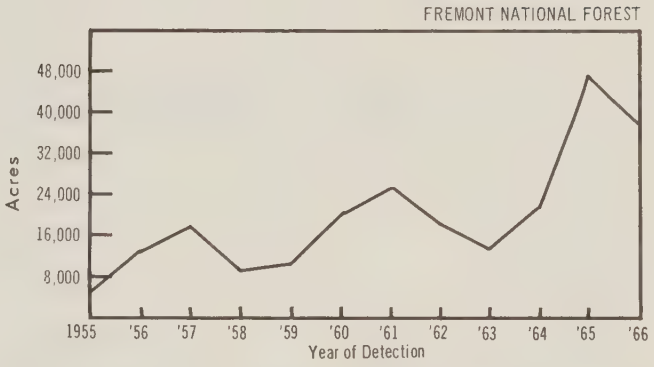
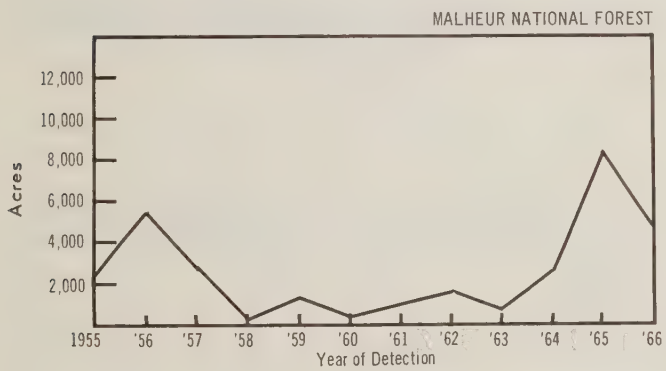


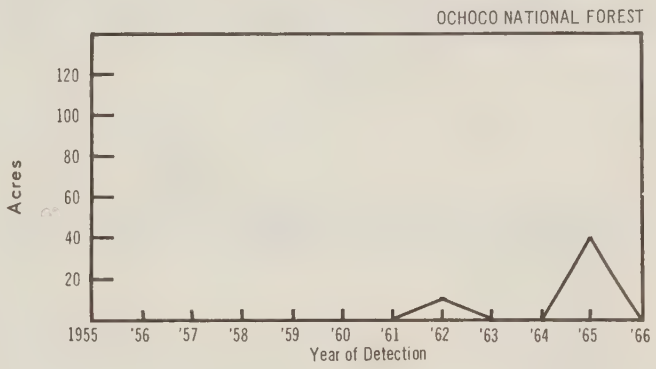
FIGURE 1-1, REGIONAL TREND OF MOUNTAIN PINE BEETLE INFESTATIONS IN LODGEPOLE PINE 1955-1966
REGIONAL
OREGON
WASHINGTON
120,000
100,000
80,000
60,000
40,000
20,000
Acres
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
Year of Detection

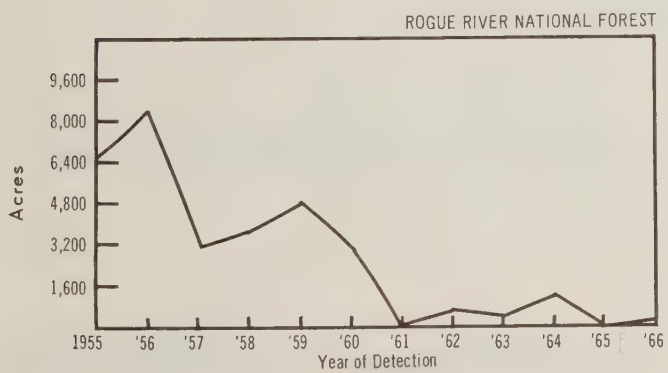
FIGURE 1-2, OREGON LANDS

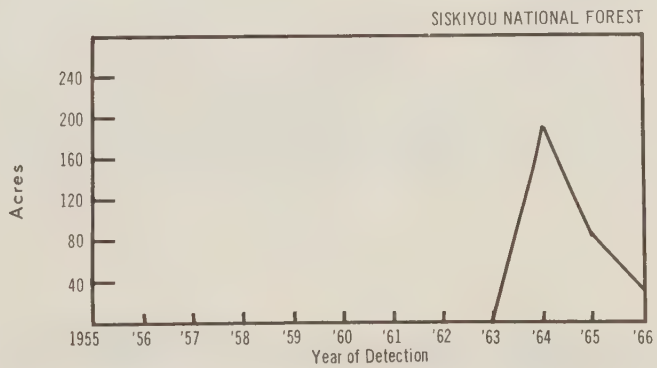












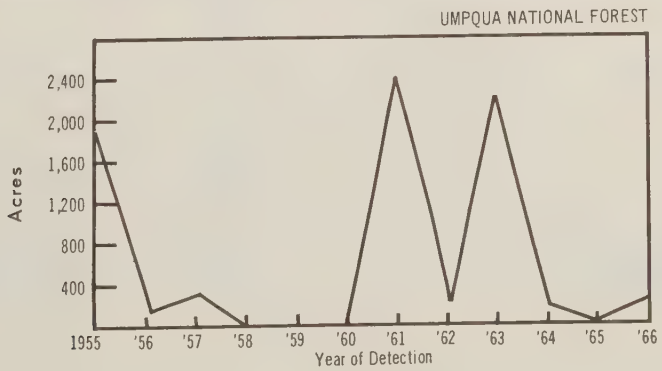
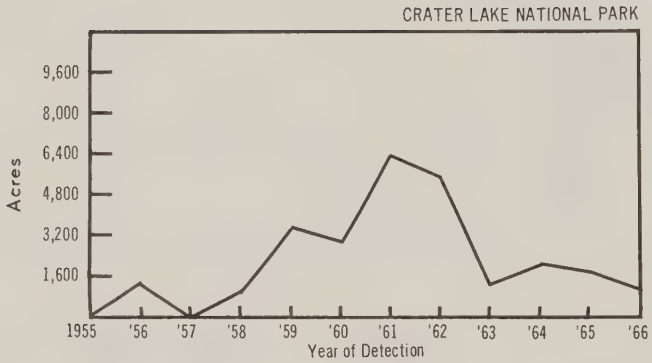
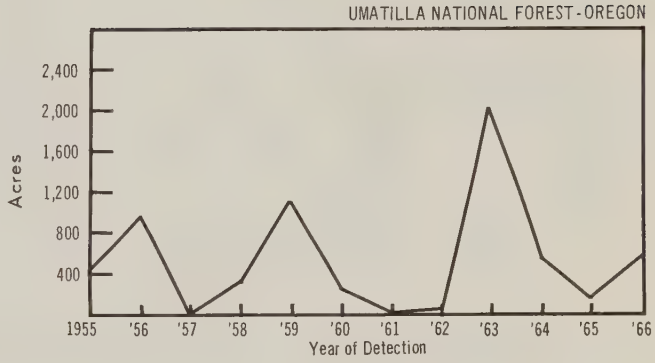
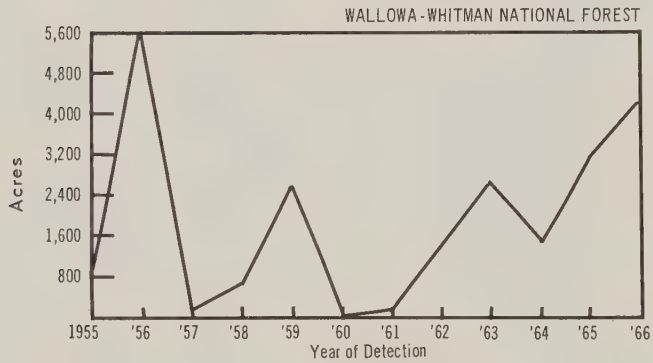
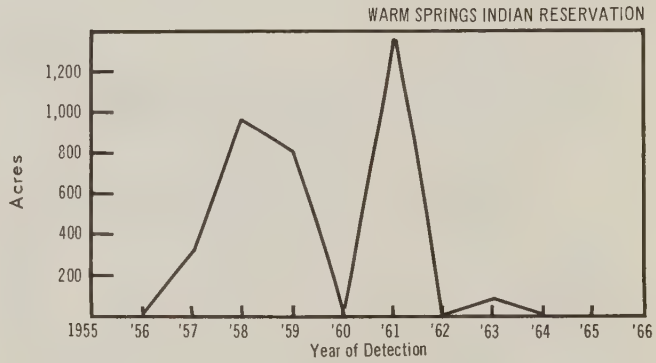


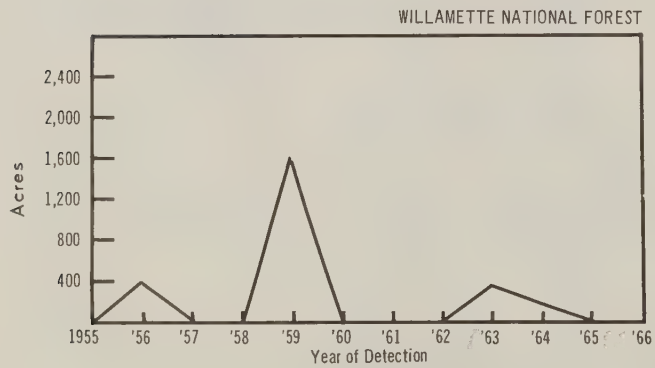
FIGURE 1-3, OREGON LANDS











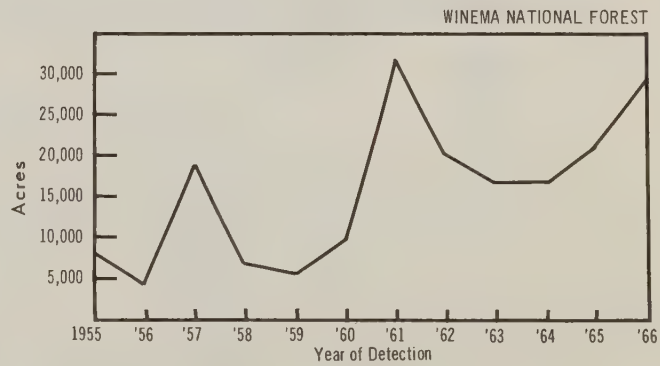
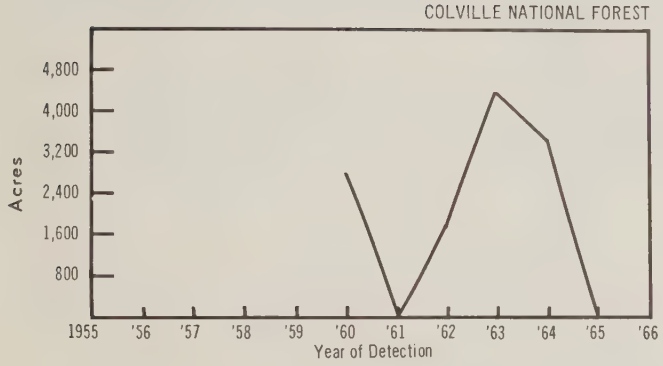
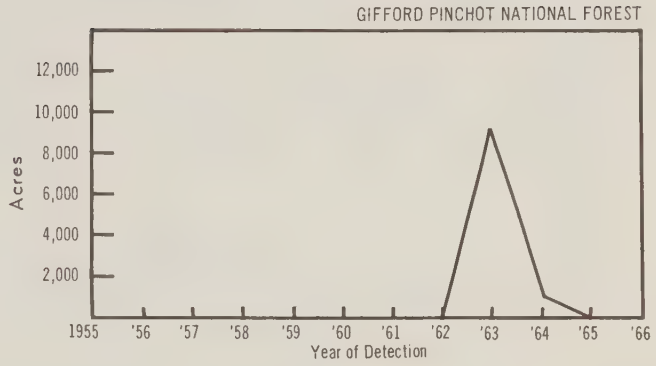
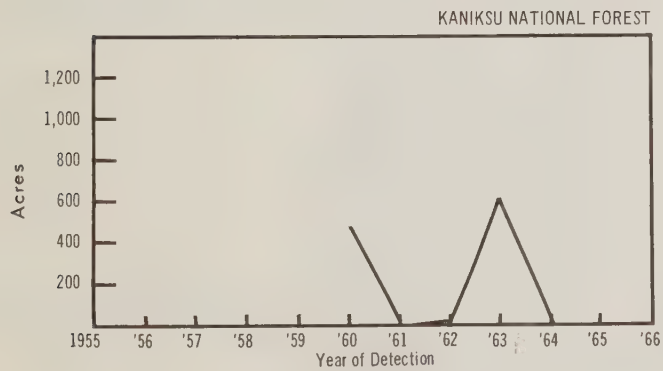
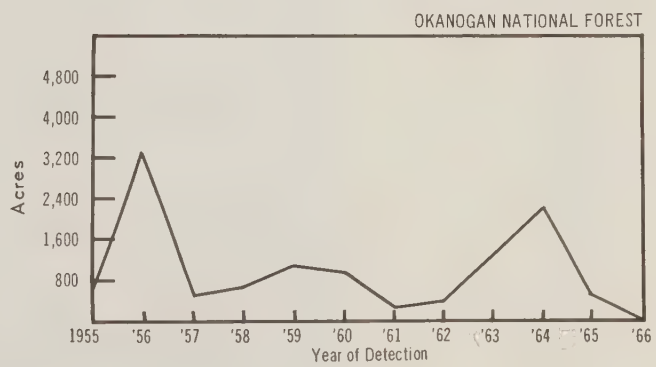


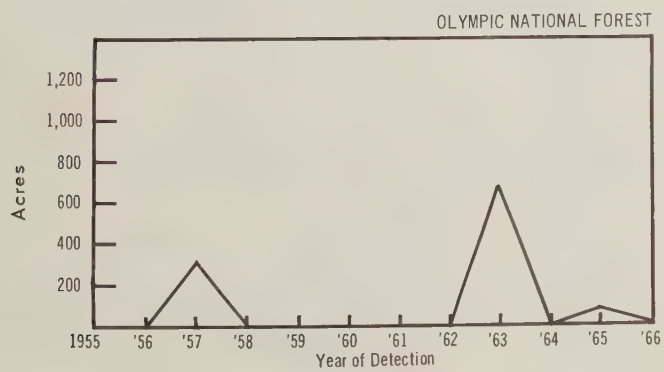
FIGURE 1-4, WASHINGTON LANDS











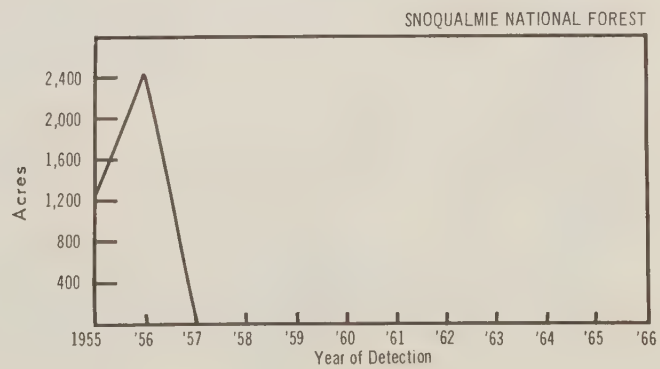
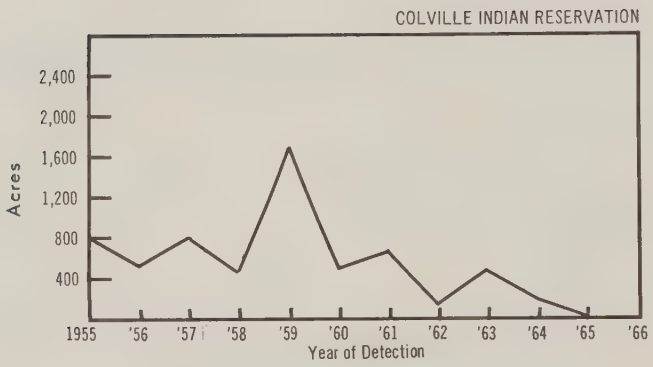
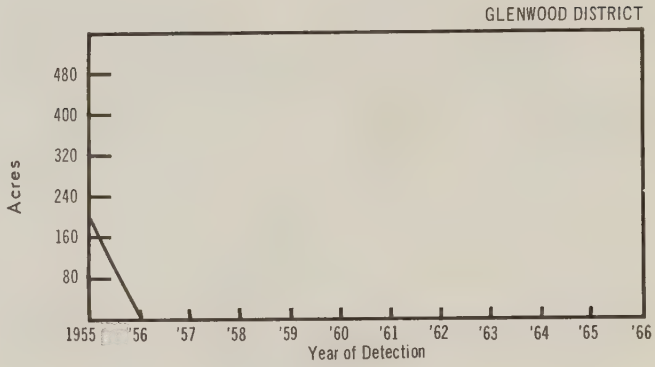
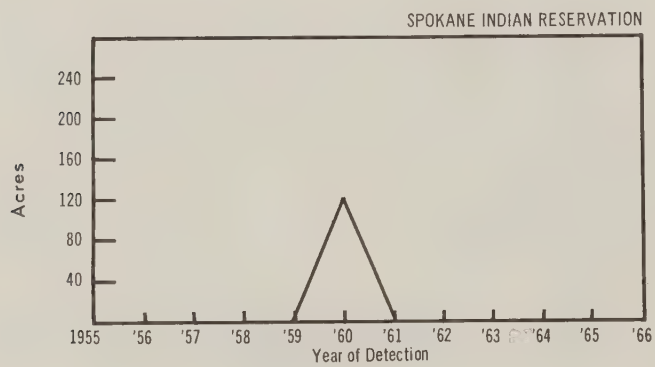
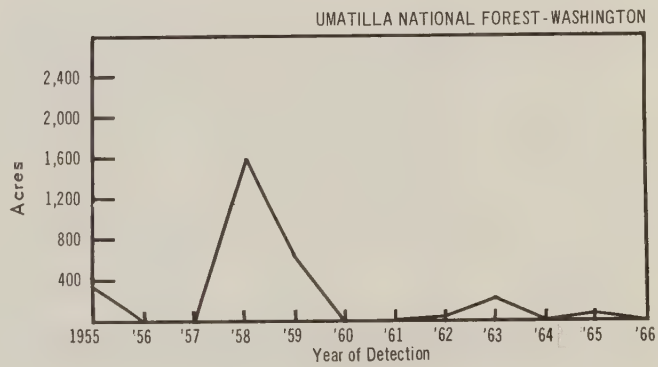


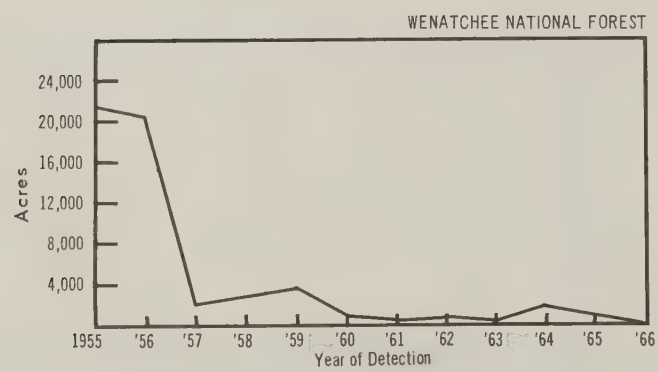
FIGURE 1-5, WASHINGTON LANDS

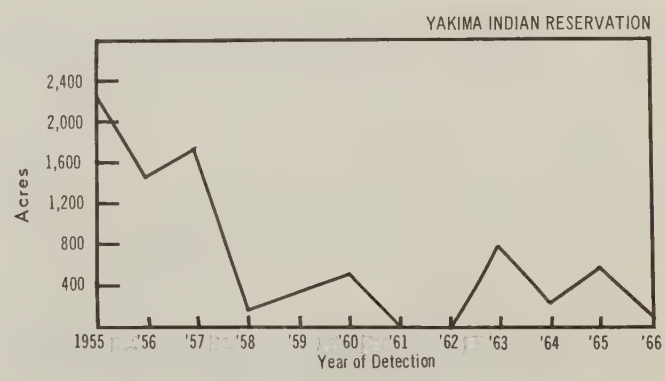












PONDEROSA PINE

History

The mountain pine beetle is a pest of second-growth ponderosa pine, particularly dense, stagnated, pole-size stands. The first major outbreak on record in the Northwest occurred in 1908 near Sumpter, Oregon on the Whitman National Forest. Control was attempted in 1910. This was the first cooperative control project between State and Federal Governments in the Northwest. Thousands of trees were felled, peeled, and either exposed to the sun or burned to kill the broods. Since that time no control efforts were undertaken until 1960 when several thousand trees on the Fremont National Forest were sprayed with ethylene dibromide. Another outbreak occurred in Sumpter Valley on the Wallowa-Whitman N.F. in 1964 and the fell, pile, and burn method was used to reduce the beetle population.

Mountain pine beetle infestation in an overstocked young ponderosa pine stand.

Damage Classification

The intensity classifications and the estimated board foot per acre used to map mountain pine beetle outbreaks in pole-size ponderosa pine stands during aerial surveys follows:

Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — *Number* — —		*Bd. ft./acre*
Light	50-350	50 or less	27.3
Moderate	350-1,000	200 or less	78.1
Heavy	1,000-2,600	400 or less	203.1
Very heavy	2,000 or more	400 and over	750.0

Location of Damage

Most of the tree killing in the Northwest has occurred in the Blue Mountains in eastern Oregon and southeastern Washington (map 2). Between 1955 and 1966 a total of 372,485 acres was infested with an estimated loss of 34.5 MM board feet (tables 4 and 5, figure 2-1). Over 77 percent of the Regional losses occurred in Oregon. Seventy-eight percent of the damage in Oregon was centered on the Wallowa-Whitman, Fremont, and Malheur National Forests (figures 2-2, 2-3).

Mountain pine egg galleries on an infested ponderosa pine.

Overstocked second-growth ponderosa pine stands such as this are potential breeding sites for the mountain pine beetle.

Results of a ground survey on the Wallowa-Whitman National Forest in a 10-year-old mountain pine beetle infestation showed growth had been set back 30 years.[2] In this outbreak a reduction in stand density, basal area, and average tree diameter had occurred. In some areas the stand has become either grossly understocked or completely converted from a ponderosa pine type to a fir-larch type.

In Washington, 45 percent of the losses were located on the Okanogan National Forest (tables 4 and 5, figure 2-4). Significant tree killing also occurred on the Yakima and Colville Indian Reservations (figure 2-5).

[2] Wortendyke, John. Appraisal of mountain pine beetle–caused tree mortality in a young ponderosa pine stand on the Wallowa Whitman National Forest. Portland, Oregon, U.S. Forest Service. 13pp. 1968.

Control Measures

If direct control is required, the fell, pile, and burn method is recommended. However, this method is only a stopgap measure. The stand is protected only for a short duration of time, usually less than 5 years. Beetle activity is a result of overstocking. Stand density must be reduced before any "beetle proofing" can be attained. The amount of reduction necessary depends upon age, site, and degree of stocking.

The fell, pile, and burn method — a "stopgap" measure for controlling the mountain pine beetle.

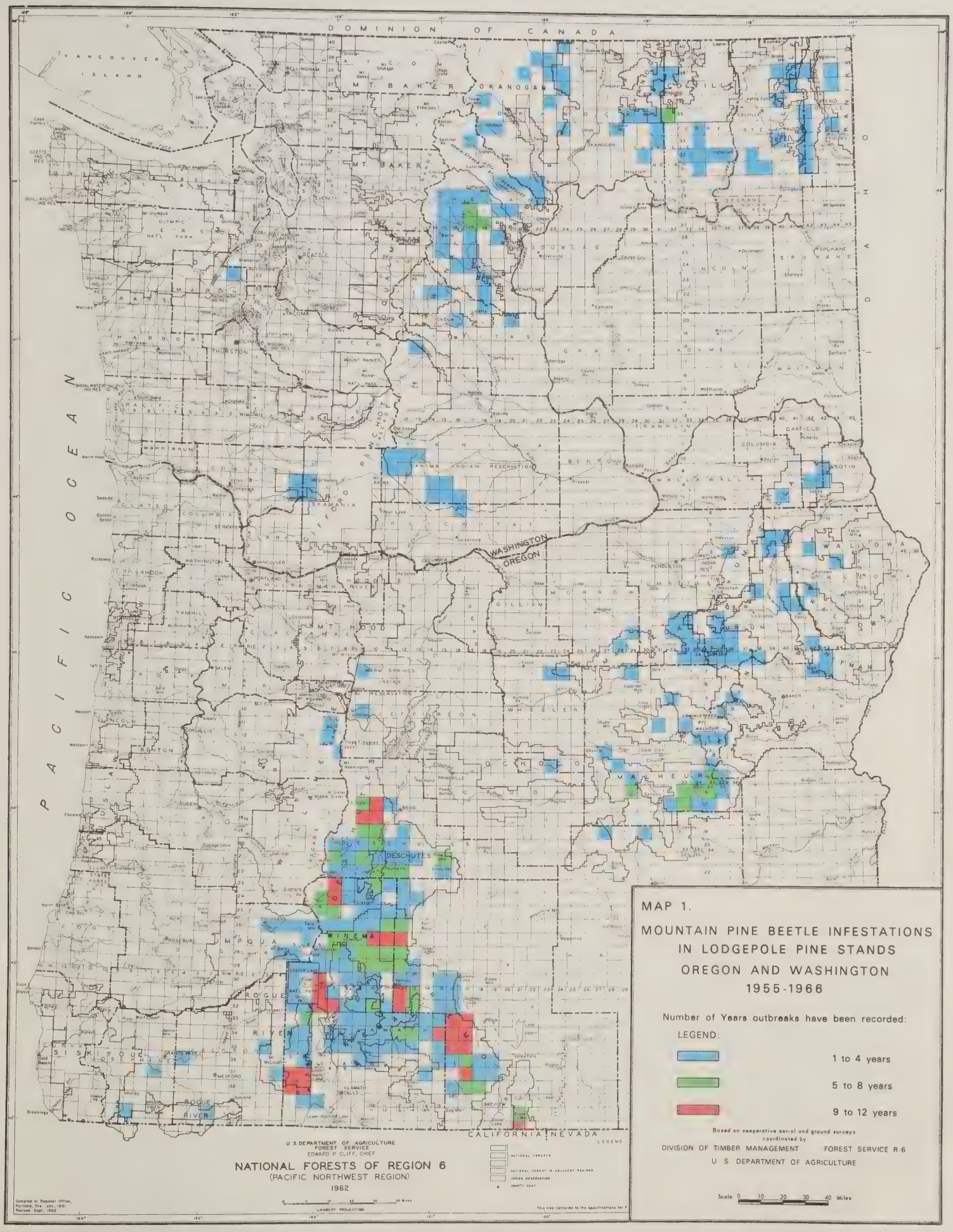
It appears that most potential mountain pine beetle outbreaks in dense, second-growth ponderosa pine can be prevented through precommercial and commercial thinnings. Proper silvicultural methods that reduce basal area to 60 percent of normal are necessary since fast growing healthy trees do not readily attract mountain pine beetle.[3]

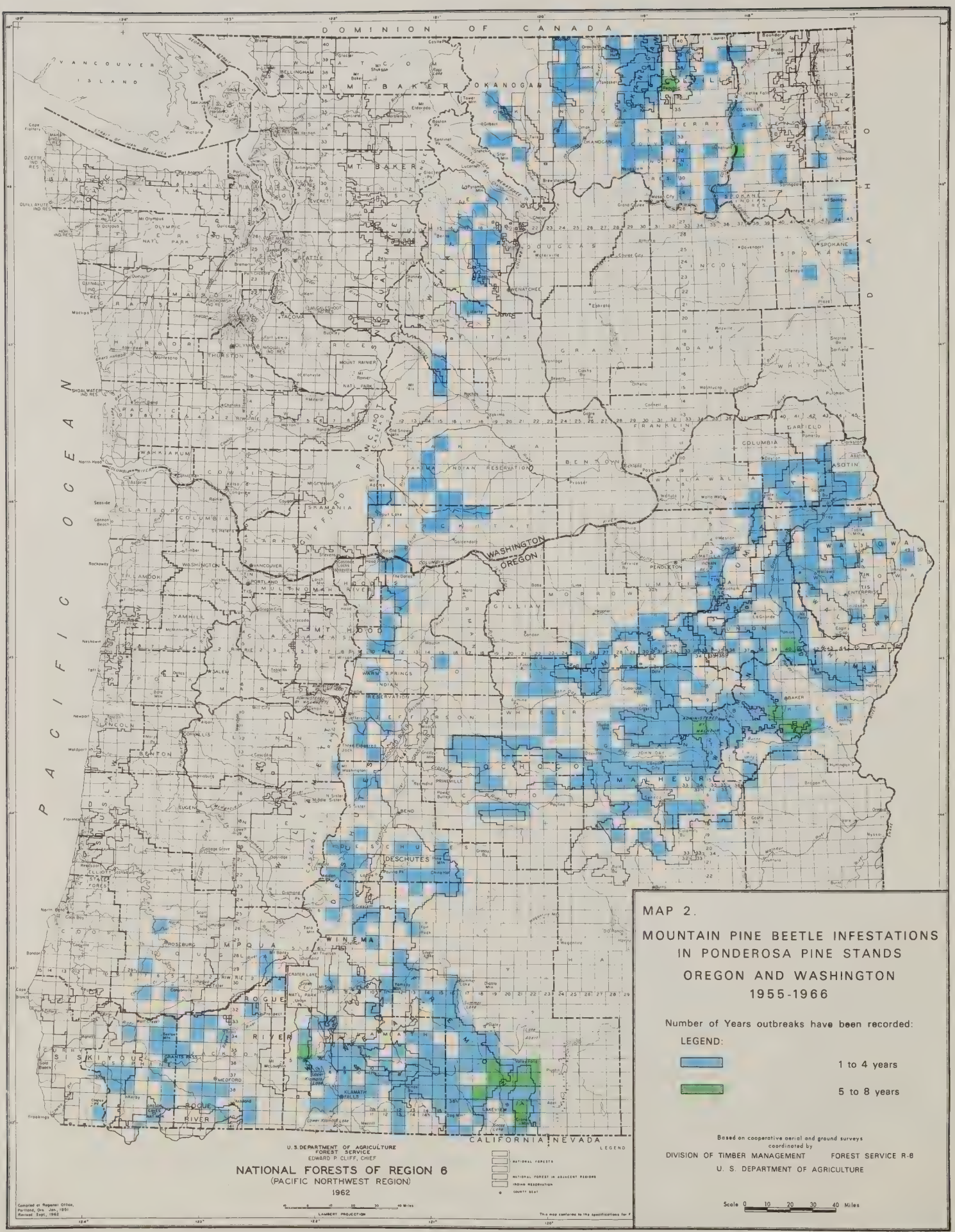
[3] For additional information, refer to Timber Stand improvement Handbook—FSH 2476.1.

Table 4.—Trend of mountain pine beetle infestations in ponderosa pine in Oregon and Washington by reporting area 1955-66
(In Acres)

Reporting Area[1]	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	480	640	--	1,760	--	2,560	640	--	275	120	2,550	1,000	10,025
Fremont N.F.	160	240	160	480	3,440	5,080	1,440	1,380	4,965	2,920	16,740	8,150	45,155
Malheur N.F.	--	--	--	--	--	1,240	480	280	1,760	6,730	29,170	4,040	43,700
Mt. Hood N.F.	--	--	--	--	--	280	--	--	--	30	50	900	1,260
Rogue River N.F.	--	1,280	--	--	--	320	960	1,200	940	1,840	170	370	7,080
Siskiyou N.F.	--	--	--	--	--	--	--	--	--	1,600	1,290	260	3,150
Umpqua N.F.	--	960	--	--	--	--	--	--	830	--	120	200	2,110
Umatilla N.F.	--	--	--	--	160	320	1,200	50	3,085	4,680	3,140	1,460	14,095
Wallowa-Whitman N.F.	620	3,360	480	--	480	4,320	11,520	910	18,685	21,400	48,410	28,480	138,665
Winema N.F.	--	960	--	320	--	--	--	--	155	910	4,910	5,590	12,845
Crater Lake N.P.	--	--	--	--	--	--	--	--	--	200	--	--	200
Warm Springs I.R.	800	--	--	--	160	240	400	--	160	70	--	320	2,150
Umatilla I.R.	--	--	--	--	--	--	--	--	--	80	20	80	180
Central Oregon Dist.	--	--	--	--	--	--	--	--	665	520	680	2,510	4,375
Coos-Douglas Dist.	--	--	--	--	--	--	--	--	--	--	--	240	240
Ochoco N.F.	--	--	--	--	--	200	--	--	700	1,340	2,370	630	5,240
Sub-total	2,060	7,440	640	2,560	4,240	14,560	16,640	3,820	32,220	42,440	109,620	54,230	290,470
Washington:													
Gifford Pinchot N.F.	--	--	--	--	--	1,440	80	--	--	160	--	--	1,680
Colville N.F.	--	--	--	--	--	--	320	160	200	2,530	3,280	2,080	8,570
Kaniksu N.F.	--	--	--	--	--	200	--	--	--	--	--	--	200
Okanogan N.F.	--	--	--	--	3,040	--	--	--	--	6,480	15,400	12,040	36,960
Snoqualmie N.F.	--	--	--	--	--	200	--	--	--	--	280	--	480
Umatilla N.F.	--	--	--	--	--	640	--	185	435	1,270	4,280	1,030	7,840
Wenatchee N.F.	--	--	--	--	800	1,360	160	--	520	120	580	860	4,400
Colville I.R.	--	--	--	--	1,120	320	480	--	--	2,070	1,010	4,000	9,000
Spokane I.R.	--	--	--	--	--	--	--	--	--	--	280	200	480
Yakima I.R.	--	--	--	--	640	180	--	960	--	680	6,780	720	9,960
Glenwood Dist.	--	--	--	--	480	--	--	40	--	520	40	560	1,640
Northeast Washington Dist.	--	--	--	--	--	400	160	--	--	--	--	240	800
Sub-total	0	0	0	0	6,080	4,740	1,200	1,345	1,155	13,830	31,930	21,730	82,010
Regional Total	2,060	7,440	640	2,560	10,320	19,300	17,840	5,165	33,375	56,270	141,550	75,960	372,480

[1] N.F., National Forest; N.P., National Park; I.R., Indian Reservation; District, State ownership.


DOMINION OF CANADA
PACIFIC OCEAN
VANCOUVER ISLAND
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MT. BAKER
OKANOGAN
WENATCHEE
YAKIMA
COLVILLE
SPOKANE
DESCHUTES
WINEMA
ROGUE RIVER
SISKIYOU
MT. HOOD
OCHOCO
MALHEUR
UMATILLA
WALLOWA
WHITMAN
OLYMPIC NAT'L PARK
MOUNT RAINIER NAT'L PARK
CRATER LAKE NAT'L PARK
WARM SPRINGS INDIAN RESERVATION
YAKIMA INDIAN RESERVATION
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
EDWARD P. CLIFF, CHIEF
NATIONAL FORESTS OF REGION 6
(PACIFIC NORTHWEST REGION)
1962
LAMBERT PROJECTION
LEGEND
NATIONAL FORESTS
NATIONAL FOREST IN ADJACENT REGIONS
INDIAN RESERVATION
COUNTY SEAT
MAP 1.
MOUNTAIN PINE BEETLE INFESTATIONS
IN LODGEPOLE PINE STANDS
OREGON AND WASHINGTON
1955-1966
Number of Years outbreaks have been recorded:
LEGEND:
1 to 4 years
5 to 8 years
9 to 12 years
Based on cooperative aerial and ground surveys
coordinated by
DIVISION OF TIMBER MANAGEMENT FOREST SERVICE R-6
U S DEPARTMENT OF AGRICULTURE
Scale 0 10 20 30 40 Miles


DOMINION OF CANADA
PACIFIC OCEAN
WASHINGTON
OREGON
CALIFORNIA
NEVADA
MAP 2.
MOUNTAIN PINE BEETLE INFESTATIONS
IN PONDEROSA PINE STANDS
OREGON AND WASHINGTON
1955-1966
Number of Years outbreaks have been recorded:
LEGEND:
1 to 4 years
5 to 8 years
Based on cooperative aerial and ground surveys
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Scale 0 10 20 30 40 Miles
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NATIONAL FORESTS OF REGION 6
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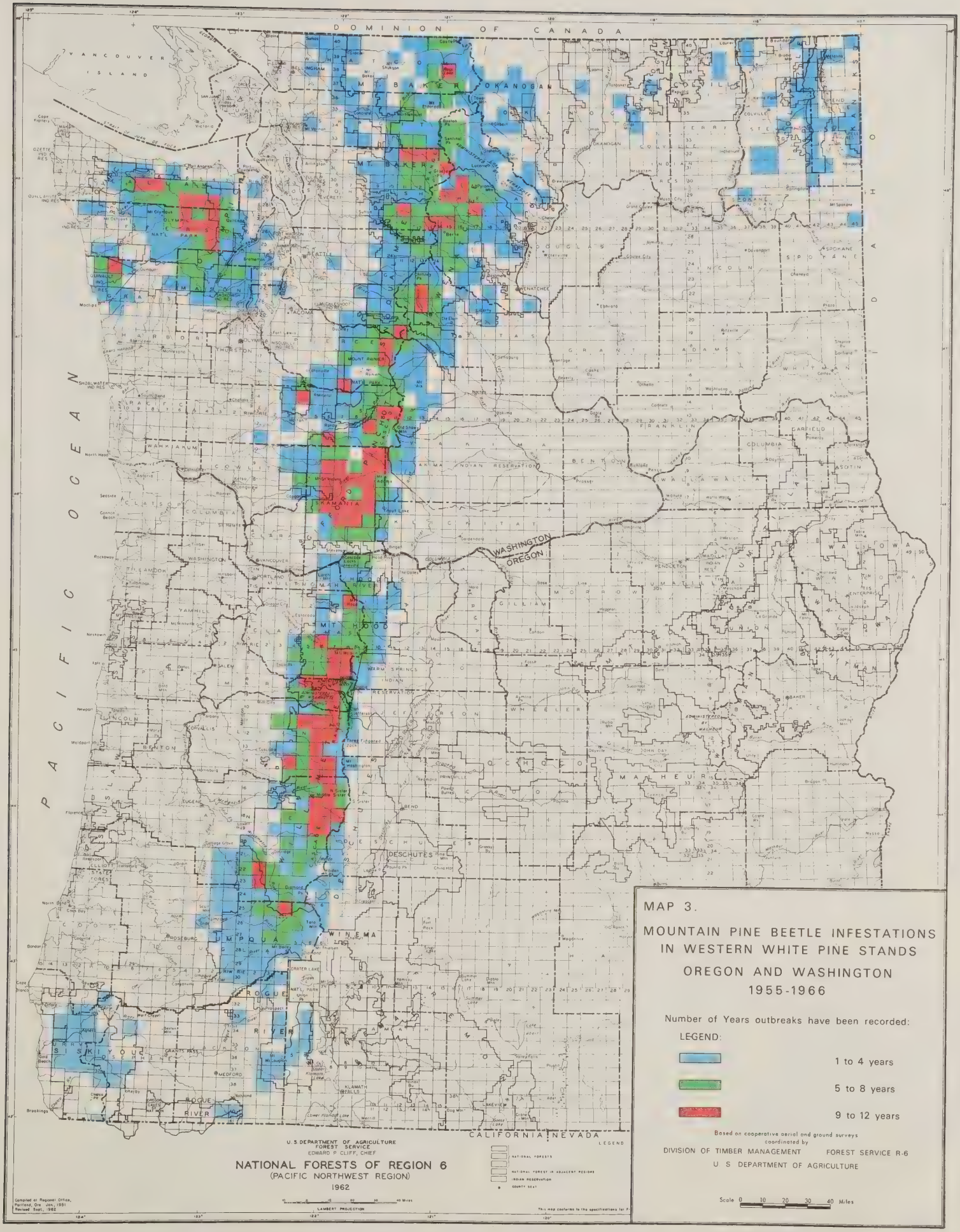
1962
LEGEND
NATIONAL FORESTS
NATIONAL FOREST IN ADJACENT REGIONS
INDIAN RESERVATION
COUNTY SEAT
LAMBERT PROJECTION
Compiled at Regional Office,
Portland, Ore. Jan. 1951
Revised Sept. 1962



U.S DEPARTMENT OF AGRICULTURE
FOREST SERVICE
EDWARD P CLIFF, CHIEF

NATIONAL FORESTS OF REGION 6
(PACIFIC NORTHWEST REGION)
1962

Compiled at Regional Office,
Portland, Ore Jan, 1951
Revised Sept, 1962

LAMBERT PROJECTION

This map conforms to the specifications for F

MAP 3.

MOUNTAIN PINE BEETLE INFESTATIONS
IN WESTERN WHITE PINE STANDS
OREGON AND WASHINGTON
1955-1966

Number of Years outbreaks have been recorded:

LEGEND:

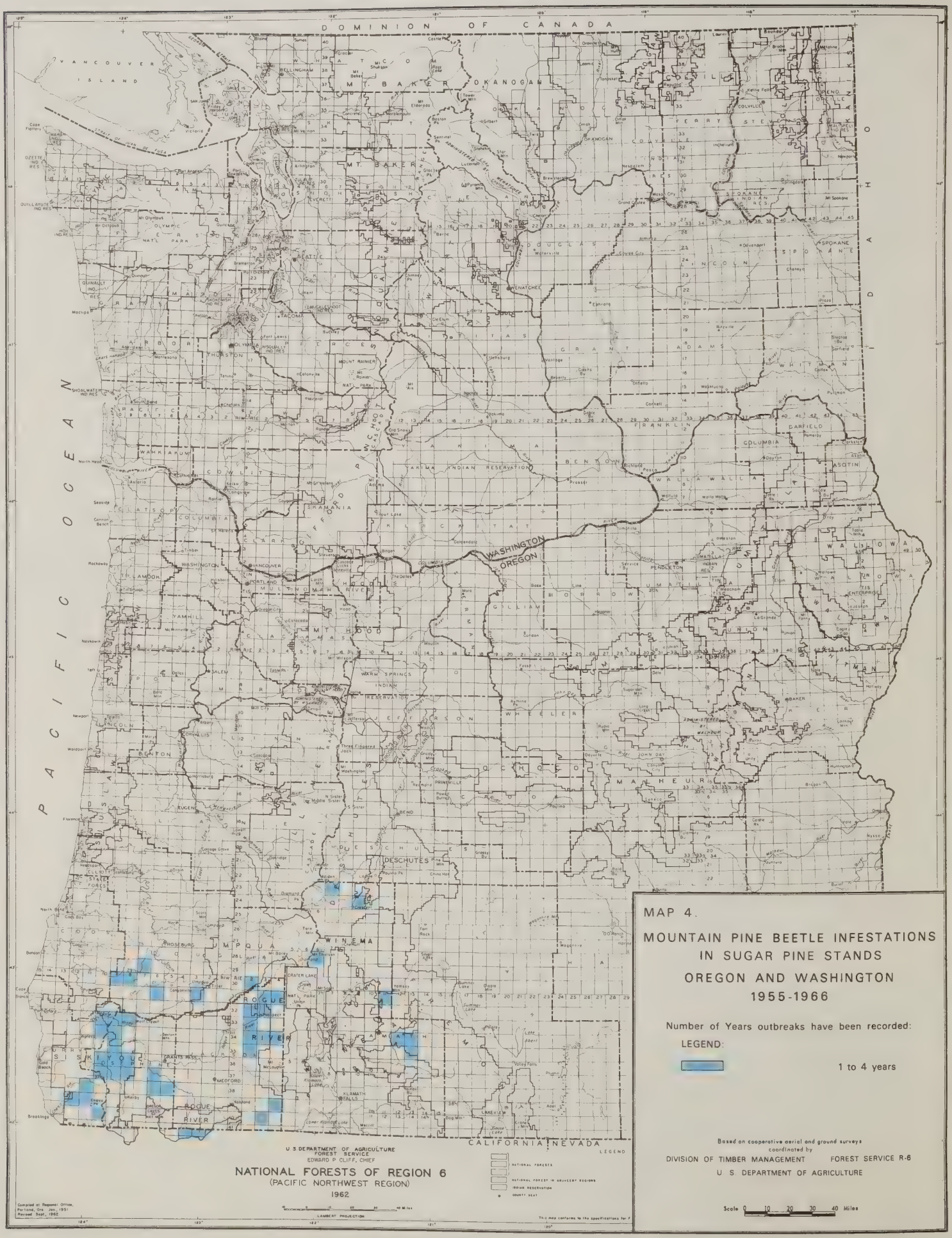
1 to 4 years

5 to 8 years

9 to 12 years

Based on cooperative aerial and ground surveys
coordinated by
DIVISION OF TIMBER MANAGEMENT FOREST SERVICE R-6
U. S DEPARTMENT OF AGRICULTURE

Scale 0 10 20 30 40 Miles


MAP 4.
MOUNTAIN PINE BEETLE INFESTATIONS
IN SUGAR PINE STANDS
OREGON AND WASHINGTON
1955-1966
Number of Years outbreaks have been recorded:
LEGEND:
1 to 4 years
Based on cooperative aerial and ground surveys
coordinated by
DIVISION OF TIMBER MANAGEMENT FOREST SERVICE R-6
U. S. DEPARTMENT OF AGRICULTURE
Scale 0 10 20 30 40 Miles
U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
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NATIONAL FORESTS OF REGION 6
(PACIFIC NORTHWEST REGION)
1962
LEGEND
NATIONAL FORESTS
INDIAN RESERVATION
COUNTY SEAT
DOMINION OF CANADA
CALIFORNIA
NEVADA
PACIFIC OCEAN
WASHINGTON
OREGON
VANCOUVER ISLAND
MT. BAKER
OKANOGAN
WENATCHEE
OLYMPIC
SEATTLE
TACOMA
SNOQUALMIE
GIFFORD PINCHOT
MOUNT RAINIER
NAT. PARK
OLYMPIA
SILVERTON
SKAMANIA
YAKIMA INDIAN RESERVATION
COLVILLE
SPOKANE
FERRY
STEVENS
PEND OREILLE
SPOKANE INDIAN RES.
COLVILLE INDIAN RES.
OKANOGAN
WALLA WALLA
COLUMBIA
GARFIELD
ASOTIN
WHITMAN
ADAMS
FRANKLIN
GRANT
BENTON
KLICKITAT
WASCO
SHERMAN
GILLIAM
MORROW
UMATILLA
UMATILLA INDIAN RESERVATION
PENDLETON
WALLOWA
UNION
BAKER
WHEELER
GRANT
JOHN DAY
MALHEUR
CROOK
DESCHUTES
JEFFERSON
WARM SPRINGS INDIAN RESERVATION
PRINEVILLE
BEND
LINCOLN
BENTON
POLK
MARION
YAMHILL
TILLAMOOK
CLATSOP
COLUMBIA
CLARK
WASHINGTON
MULTNOMAH
HOOD RIVER
WASCO
SHERMAN
SALEM
EUGENE
CORVALLIS
ALBANY
PORTLAND
VANCOUVER
LINN
DOUGLAS
COOS
CURRY
JOSEPHINE
JACKSON
KLAMATH
LAKE
WINEMA
MEDFORD
ROSEBURG
GRANTS PASS
KLAMATH FALLS
LAKEVIEW
CRATER LAKE NAT. PARK
ROGUE RIVER
SISKIYOU
UMPQUA
SIUSLAW
SIUSLAW NATIONAL FOREST
ROGUE RIVER NATIONAL FOREST
UMPQUA NATIONAL FOREST
WINEMA NATIONAL FOREST
MALHEUR NATIONAL FOREST
OCHOCO NATIONAL FOREST
DESCHUTES NATIONAL FOREST
FREMONT NATIONAL FOREST
WILLAMETTE NATIONAL FOREST
MT. HOOD NATIONAL FOREST
GIFFORD PINCHOT NATIONAL FOREST
MT. BAKER NATIONAL FOREST
OKANOGAN NATIONAL FOREST
WENATCHEE NATIONAL FOREST
SNOQUALMIE NATIONAL FOREST
OLYMPIC NATIONAL FOREST
OLYMPIC NATIONAL PARK
Compiled at Regional Office,
Portland, Ore. Jan., 1951
Revised Sept., 1962
LAMBERT PROJECTION

Table 5.—Extent and estimated volume of ponderosa pine killed by the mountain pine beetle in Oregon and Washington by reporting unit 1955-66[1]

Reporting Area[2]	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*
Oregon:										
Deschutes N.F.	8,105	221,267	1,560	121,836	360	73,116	--	--	10,025	416,219
Fremont N.F.	19,665	536,855	19,375	1,513,188	5,155	1,046,981	960	720,000	45,155	3,817,024
Malheur N.F.	30,495	832,514	8,845	690,795	4,360	885,516	--	--	43,700	2,408,825
Mt. Hood N.F.	630	17,199	270	21,087	360	73,116	--	--	1,260	111,402
Ochoco N.F.	5,240	143,052	--	--	--	--	--	--	5,240	143,052
Rogue River N.F.	4,760	129,948	2,080	162,448	160	32,496	80	60,000	7,080	384,892
Siskiyou N.F.	3,030	82,719	120	9,372	--	--	--	--	3,150	92,091
Umpqua N.F.	910	24,843	1,200	93,720	--	--	--	--	2,110	118,563
Wallowa-Whitman N.F.	72,130	1,969,149	38,220	2,984,982	17,735	3,601,979	10,580	7,935,000	138,665	16,491,110
Umatilla N.F.	12,005	327,737	2,090	163,229	--	--	--	--	14,095	490,966
Winema N.F.	9,865	269,315	2,120	165,572	620	125,922	240	180,000	12,845	740,809
Crater Lake N.P.	200	5,460	--	--	--	--	--	--	200	5,460
Warm Springs I.R.	710	19,383	1,440	112,464	--	--	--	--	2,150	131,847
Central Oregon Dist.	3,415	93,230	920	71,852	40	8,124	--	--	4,375	173,206
Coos-Douglas Dist.	240	6,552	--	--	--	--	--	--	240	6,552
Umatilla I.R.	180	4,914	--	--	--	--	--	--	180	4,914
Sub-total	171,580	4,684,137	78,240	6,110,545	28,790	5,847,250	11,860	8,895,000	290,470	25,536,932
Washington:										
Gifford Pinchot N.F.	1,680	45,864	--	--	--	--	--	--	1,680	45,864
Colville N.F.	2,770	75,621	1,700	132,770	2,980	605,238	1,120	840,000	8,570	1,653,629
Kaniksu N.F.	200	5,460	--	--	--	--	--	--	200	5,460
Okanogan N.F.	13,240	361,452	14,690	1,147,289	6,560	1,332,336	2,470	1,852,500	36,960	4,693,577
Snoqualmie N.F.	200	5,460	280	21,868	--	--	--	--	480	27,328
Umatilla N.F.	7,250	197,925	590	46,079	--	--	--	--	7,840	244,004
Wenatchee N.F.	2,480	67,704	440	34,364	1,120	227,472	360	270,000	4,400	599,540
Colville I.R.	5,570	152,061	2,600	203,060	590	119,829	240	180,000	9,000	654,950
Spokane I.R.	480	13,104	--	--	--	--	--	--	480	13,104
Yakima I.R.	3,860	105,378	4,940	385,814	760	154,356	400	300,000	9,960	945,548
Glenwood Dist.	1,640	44,772	--	--	--	--	--	--	1,640	44,772
Northeast Dist.	480	13,104	320	24,992	--	--	--	--	800	38,096
Sub-total	39,850	1,087,905	25,560	1,996,236	12,010	2,439,231	4,590	3,442,500	82,010	8,965,872
Regional Total	211,430	5,772,042	103,800	8,106,781	40,800	8,286,481	16,450	12,337,500	372,480	34,502,804

[1] Estimated average tree: 9 in. d.b.h.; 50 ft. tall; 50 bd. ft.
[2] N.F., National Forest; N.P., National Park; I.R., Indian Reservation; Dist., State ownership.

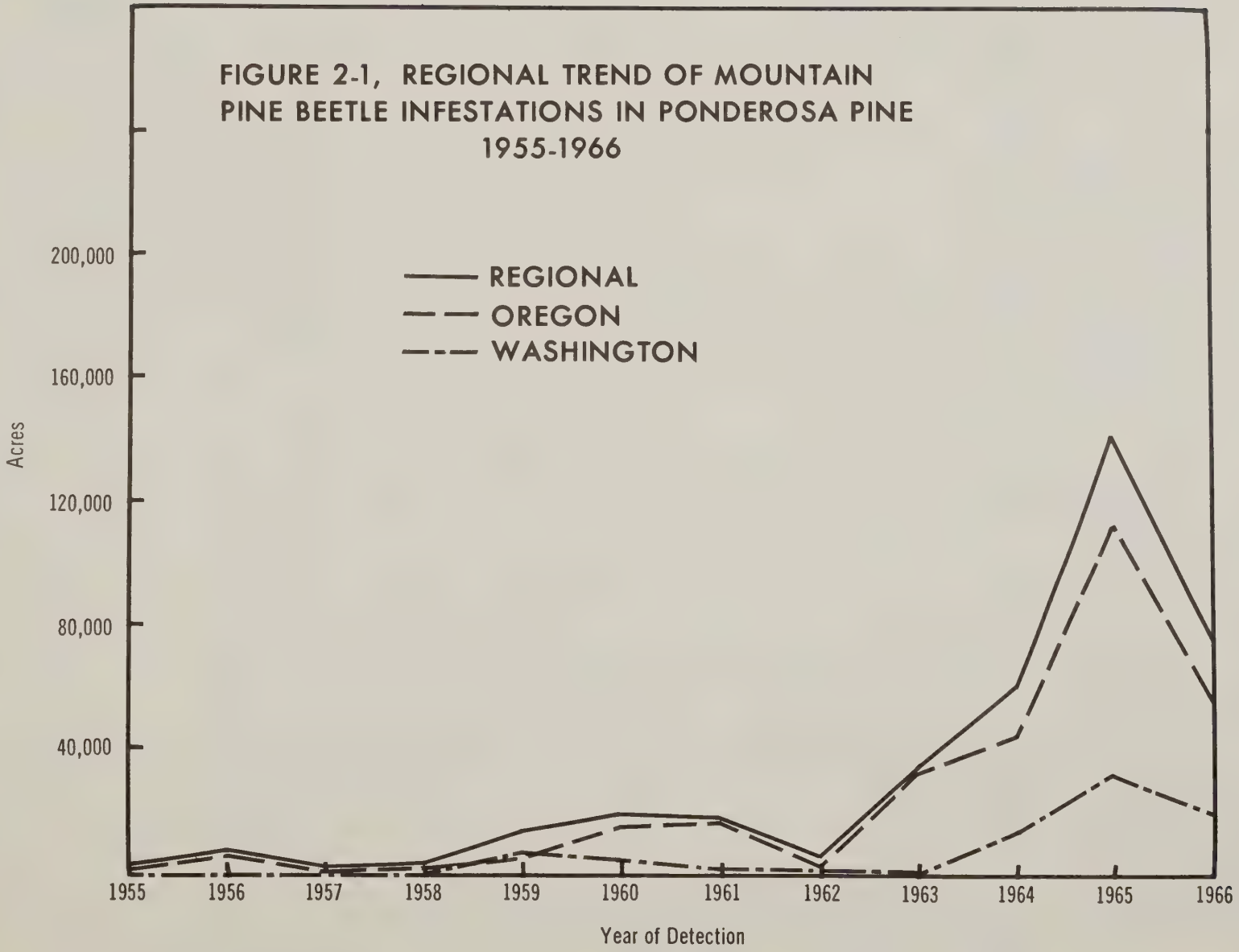
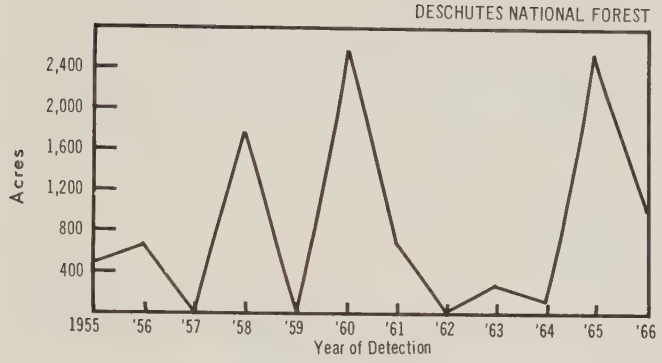
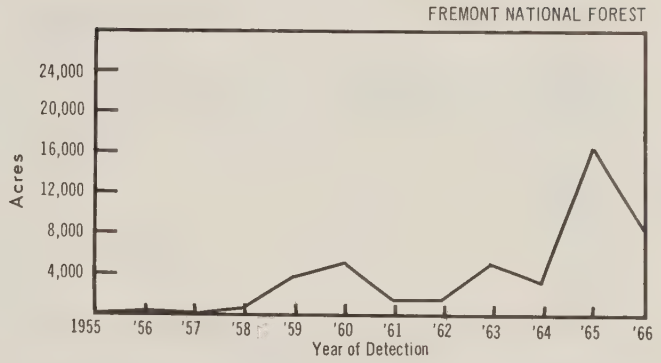
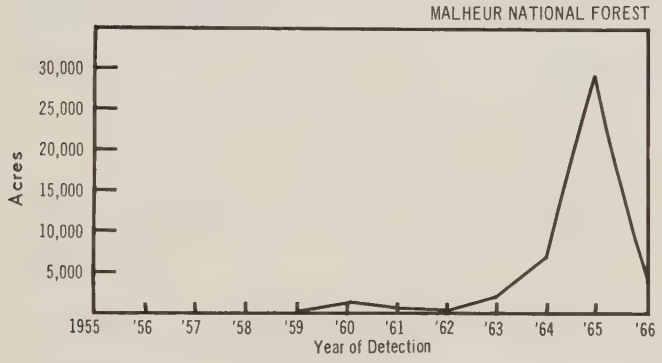


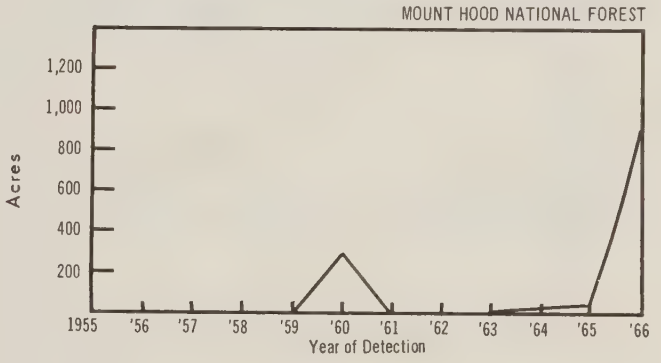
FIGURE 2-1, REGIONAL TREND OF MOUNTAIN PINE BEETLE INFESTATIONS IN PONDEROSA PINE 1955-1966
REGIONAL
OREGON
WASHINGTON
200,000
160,000
120,000
80,000
40,000
Acres
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
Year of Detection

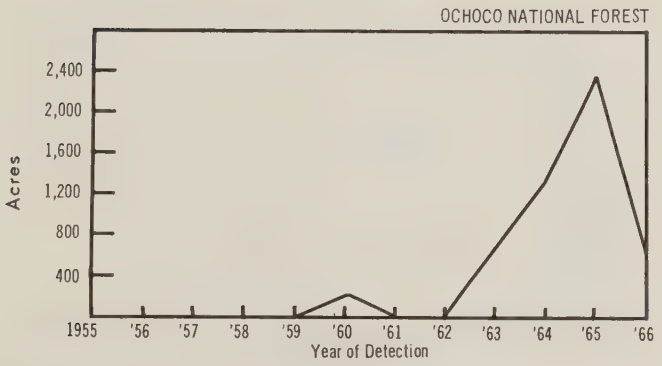
FIGURE 2-2, OREGON LANDS

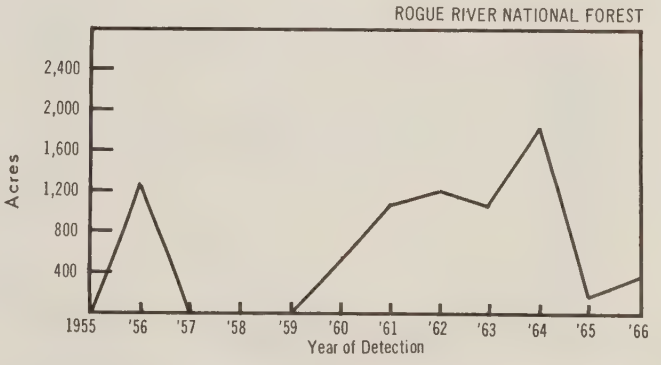


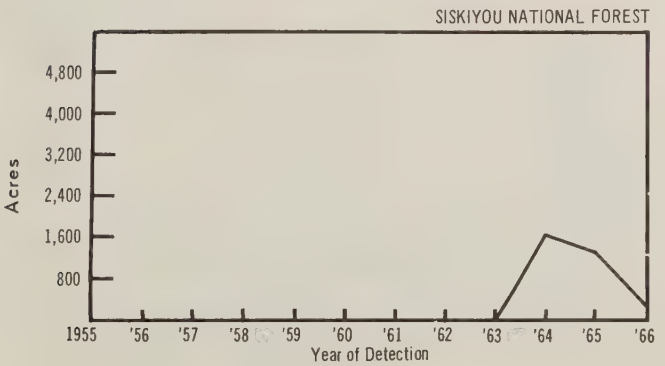












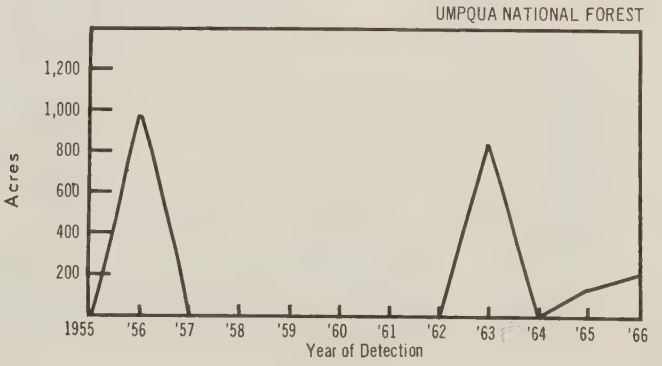


FIGURE 2-3, OREGON LANDS

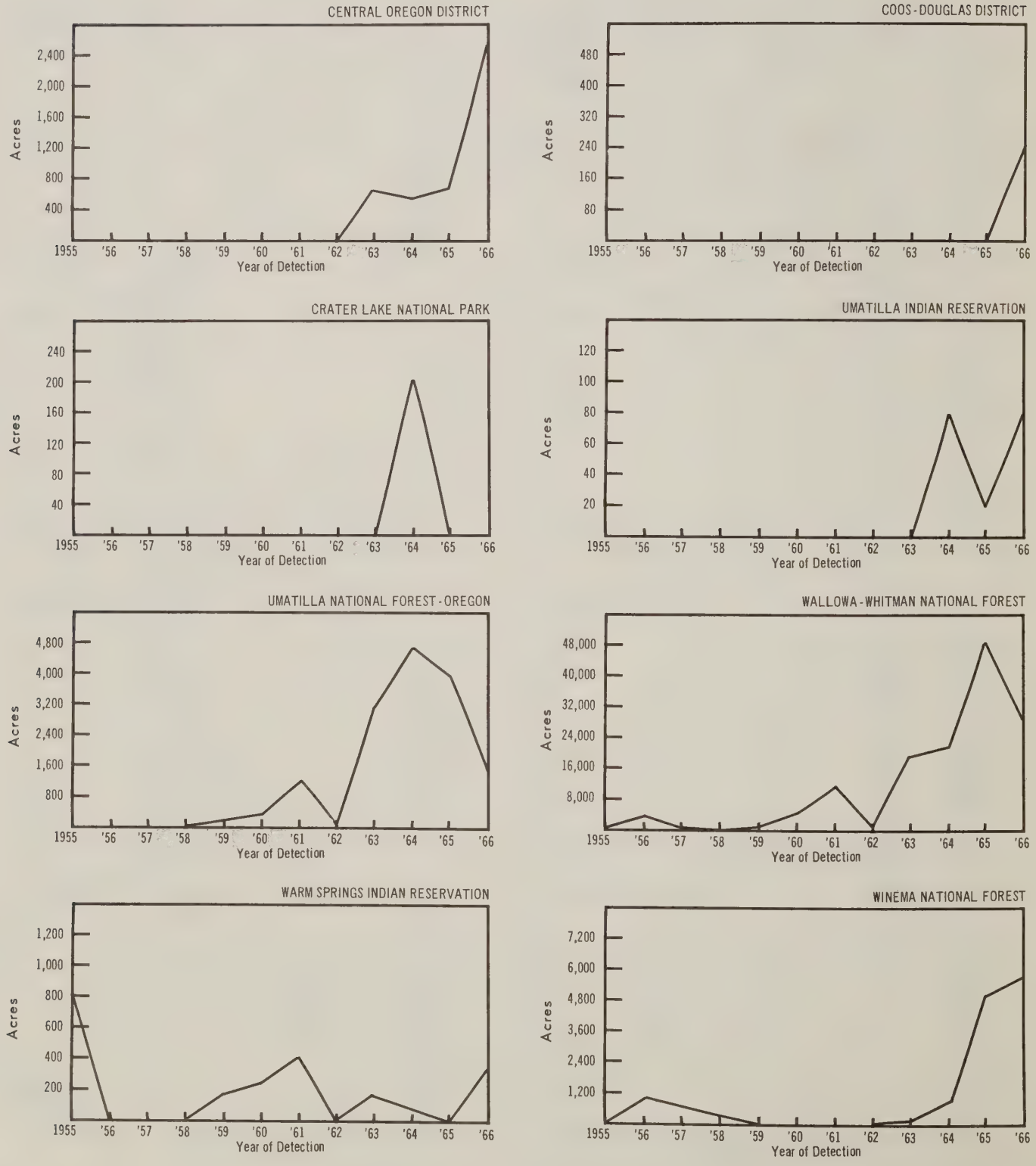
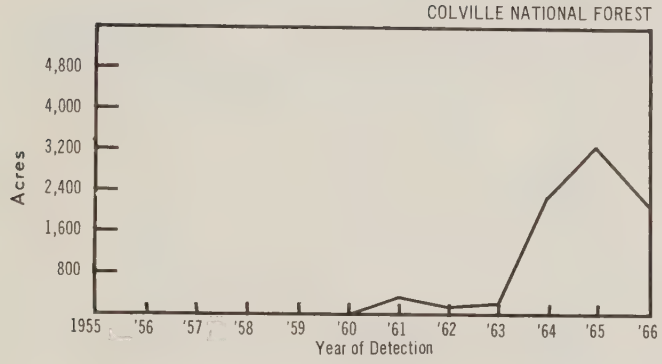
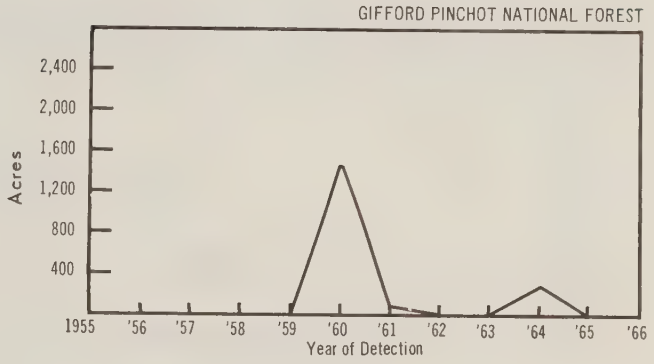
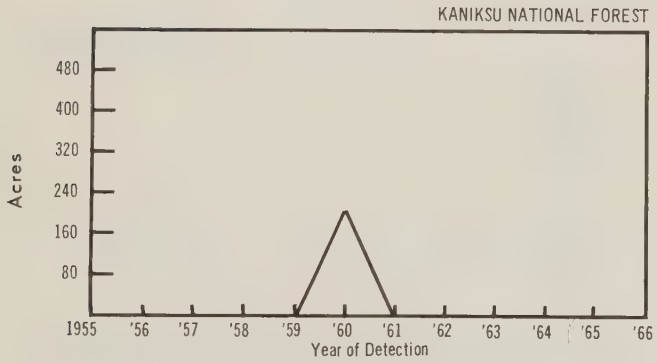
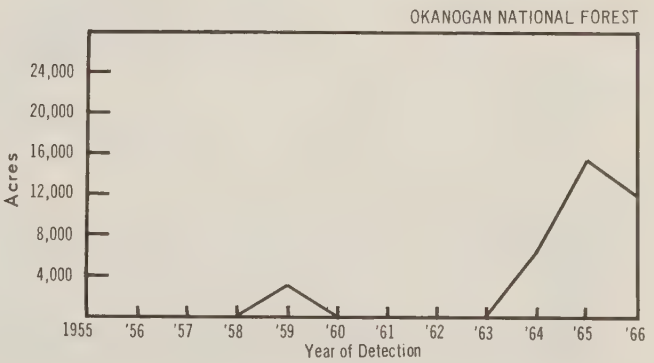


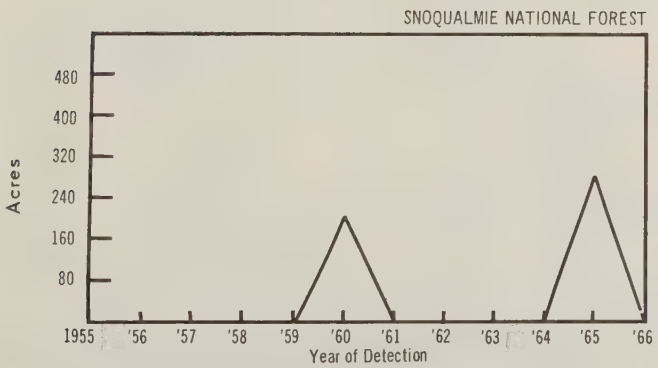
FIGURE 2-4, WASHINGTON LANDS











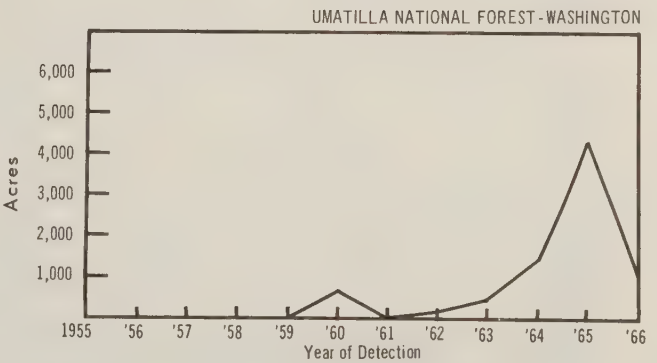
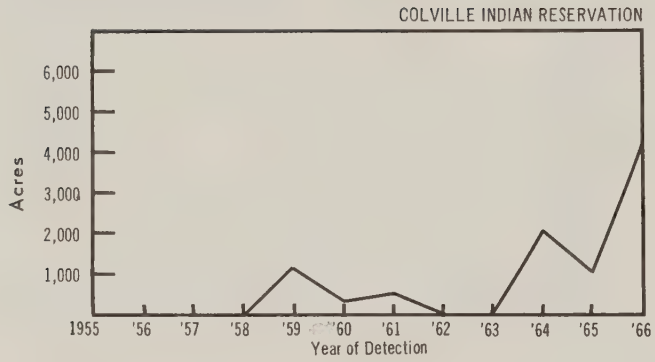
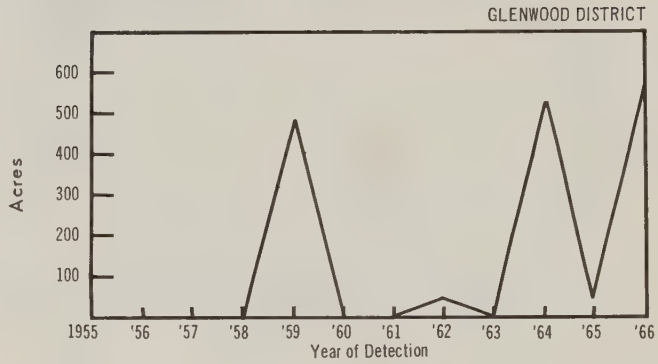
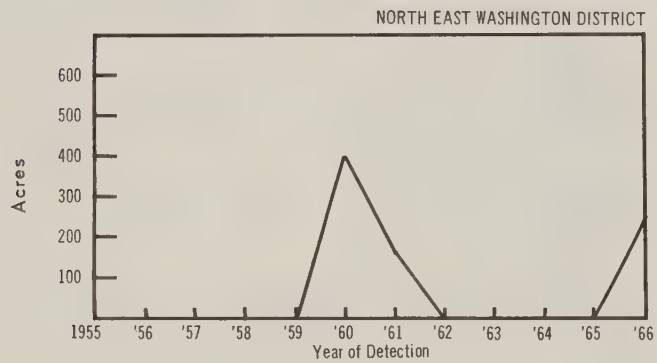
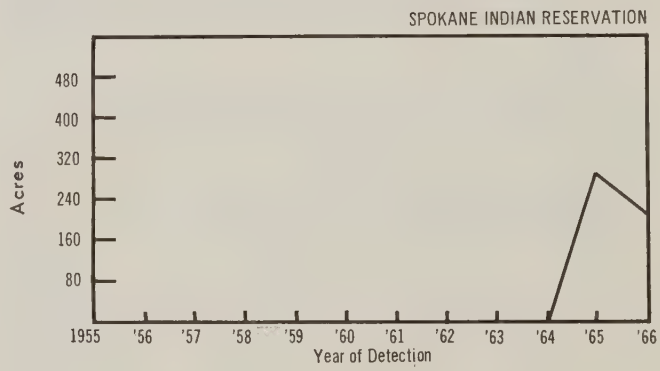


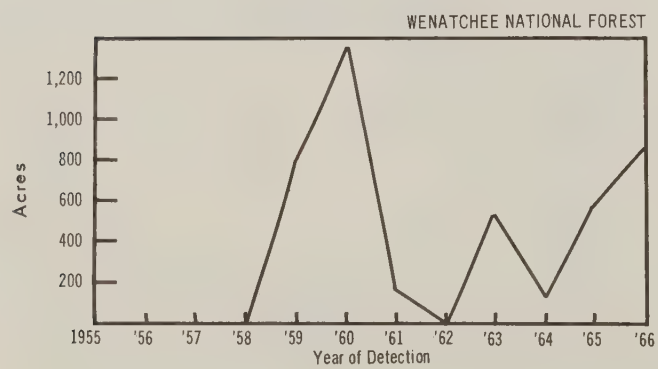
FIGURE 2-5, WASHINGTON LANDS

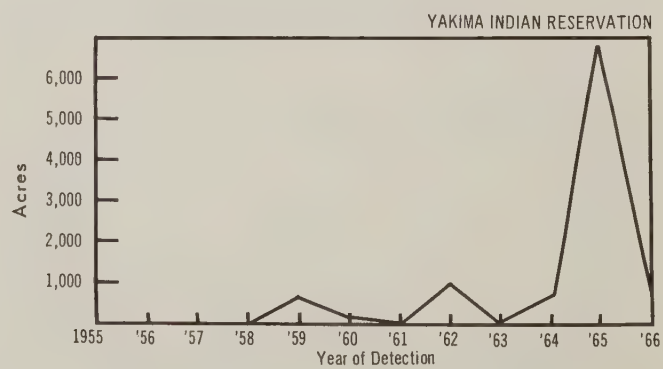












WESTERN WHITE PINE

History

The mountain pine beetle is a serious pest of mature and overmature western white pine stands. It has killed large volumes of white pine, particularly in the Cascade Mountains. Such losses have been of special concern in Mount Rainier National Park where direct control was tried during the late 1920's.

Damage Classification

The intensity classification used when mapping mountain pine beetle infestations in western white pine during aerial surveys follows:

Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — *Number* — —		*Bd. ft./acre*
Light	20-50	5 or less	39.1
Moderate	50-150	15 or less	117.2
Heavy	150-300	30 or less	234.4
Very heavy	300 or more	30 and more	709.3

Location of Damage

Since 1955 the mountain pine beetle has destroyed the western white pine on nearly 3 million acres. Most of this loss occurred in overmature stands (map 3, table 6). The estimated volume loss during this 12-year period is nearly 334 MM board feet (table 7). Regionwide, 77 percent of the tree killing occurred in Washington with two-thirds of this loss located on the Olympic National Park and the Gifford Pinchot and Wenatchee National Forests (table 7, figures 3-1, 3-4). Significant losses also occurred on the Mount Baker and Snoqualmie National Forests (figure 3-4).

In Oregon, 88 percent of the State's losses occurred on the Mount Hood and Willamette National Forests (figures 3-2, 3-3). Lesser damage was found on the Umpqua and Siskiyou National Forests.

Control Measures

In most instances the mountain pine beetle problem in western white pine stands can be kept at a minimum with shorter rotations. Young thrifty trees are fairly resistant, but in older stands this beetle is usually present in endemic form causing an annual loss. Direct control has not been considered practical in the Northwest due to the prevalence of white pine blister rust. This rust has infected many western white pine stands in the Cascade Mountains in both States and has caused tree mortality. Control efforts against the mountain pine beetle have been limited to salvaging all accessible, merchantable infested and noninfested trees in the outbreak centers.

Table 6.—Trend of mountain pine beetle infestations in western white pine in Oregon and Washington by reporting area 1955-66
(In Acres)

Reporting Area[1]	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	--	--	--	--	--	--	3,040	--	1,525	1,640	230	30	6,465
Fremont N.F.	--	--	--	--	--	--	--	--	--	--	--	100	100
Mt. Hood N.F.	6,720	20,580	4,640	7,040	28,480	11,720	29,000	33,240	39,770	36,820	27,810	7,720	253,540
Rogue River N.F.	--	--	--	--	--	--	--	--	--	190	920	480	1,590
Siskiyou N.F.	--	--	--	--	--	--	160	--	--	4,340	1,680	5,660	11,840
Siuslaw N.F.	--	160	--	--	--	--	--	--	--	--	--	--	160
Umpqua N.F.	--	400	320	1,120	1,600	720	14,080	7,760	3,355	6,070	2,920	21,130	59,475
Willamette N.F.	4,960	13,540	24,320	24,000	29,440	18,600	68,100	32,560	22,500	43,440	38,240	34,750	354,450
Winema N.F.	--	--	--	--	--	--	--	--	615	--	240	--	855
Crater Lake N.P.	--	--	--	--	--	--	--	--	--	--	--	1,590	1,590
Coos-Douglas Dist.	--	--	--	--	--	--	--	--	--	--	--	80	80
Warm Sprgs. I.R.	480	--	--	--	--	--	--	160	80	200	80	--	1,000
Sub-total	12,160	34,680	29,280	32,160	59,520	31,040	114,380	73,720	67,845	92,700	72,120	71,540	691,145
Washington:													
Colville N.F.	--	--	--	--	--	40	160	--	--	3,690	9,280	4,820	17,990
Gif. Pinchot N.F.	36,800	71,040	55,840	59,680	76,400	109,920	164,520	140,370	98,330	31,300	12,870	3,720	860,790
Kaniksu N.F.	--	--	--	--	--	240	--	940	1,290	10,440	3,480	2,120	18,510
Mt. Baker N.F.	19,520	24,900	14,880	29,280	21,600	6,040	20,200	25,540	43,060	4,270	1,440	8,320	219,050
Okanogan N.F.	--	--	160	--	--	6,560	--	250	1,005	130	840	1,560	10,505
Olympic N.F.	6,880	6,200	4,480	22,080	8,640	6,000	14,760	19,000	23,600	15,870	7,960	2,320	137,790
Snoqualmie N.F.	7,360	16,740	16,160	33,280	4,700	14,280	12,800	32,055	32,060	22,640	11,960	9,100	213,135
Wenatchee N.F.	6,880	4,320	6,080	15,360	17,440	43,600	24,360	34,480	79,285	20,640	40,520	21,640	314,605
Mt. Rainier N.P.	2,080	2,740	640	1,920	960	920	3,360	7,255	9,740	4,240	1,920	880	36,655
Olympic N.P.	960	2,640	3,840	24,800	16,400	19,440	46,160	87,000	114,600	57,270	26,940	12,980	413,030
Spokane I.R.	--	--	--	--	--	--	--	--	--	--	--	240	240
Yakima I.R.	640	--	--	--	--	--	--	320	535	1,040	2,920	1,920	7,375
Quinault I.R.	--	1,600	480	4,480	7,040	3,360	4,800	2,560	7,040	2,180	5,320	4,750	43,610
Glenwood Dist.	--	--	--	--	--	--	160	--	--	--	1,160	--	1,320
Puget Sound Dist.	--	--	--	--	--	--	--	--	--	--	720	--	720
N.W. Wash. Dist.	--	--	--	--	160	--	480	--	--	1,560	--	--	2,200
N.E. Wash. Dist.	--	--	--	--	--	--	--	--	--	720	--	40	760
Sub-total	81,120	130,180	102,560	190,880	153,340	210,400	291,760	349,770	410,545	175,990	127,330	74,410	2,298,285
Regional Total	93,280	164,860	131,840	223,040	212,860	241,440	406,140	423,490	478,390	268,690	199,450	145,950	2,989,430

[1] N.F., National Forest; N.P., National Park; I.R., Indian Reservation; District, State ownership.

Table 7.—Extent and estimated volume of western white pine killed by the mountain pine beetle in Oregon and Washington by reporting unit 1955-66[1]

Reporting Area[2]	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*
Oregon:										
Deschutes N.F.	5,295	207,035	730	85,556	441	103,136	--	--	6,466	395,727
Fremont N.F.	100	3,910	--	--	--	--	--	--	100	3,910
Mt. Hood N.F.	133,590	5,223,369	71,210	8,345,812	42,320	9,919,808	6,420	4,553,706	253,540	28,042,695
Rogue River N.F.	1,310	51,221	280	32,816	--	--	--	--	1,590	84,037
Siskiyou N.F.	10,090	394,519	1,750	205,100	--	--	--	--	11,840	599,619
Siuslaw N.F.	160	6,256	--	--	--	--	--	--	160	6,256
Umpqua N.F.	42,595	1,665,465	14,010	1,641,972	2,060	482,864	810	574,533	59,475	4,364,834
Willamette N.F.	187,530	7,332,423	101,810	11,932,132	57,830	13,555,352	7,280	5,163,704	354,450	37,983,611
Winema N.F.	855	33,431	--	--	--	--	--	--	855	33,431
Coos-Douglas Dist.	80	3,128	--	--	--	--	--	--	80	3,128
Crater Lake N.P.	540	21,114	390	45,708	420	98,448	240	170,232	1,590	335,502
Warm Springs I.R.	520	20,332	480	56,256	--	--	--	--	1,000	76,588
Sub-total	382,665	14,962,203	190,660	22,345,352	103,071	24,159,608	14,750	10,462,175	691,146	71,929,338
Washington:										
Colville N.F.	6,260	244,766	3,220	377,384	7,190	1,685,336	1,320	936,276	17,990	3,243,762
Gifford Pinchot N.F.	329,960	12,901,436	325,680	38,169,696	165,170	38,715,848	39,980	28,557,814	860,790	118,344,794
Kaniksu N.F.	13,070	511,037	5,010	587,172	430	100,792	--	--	18,510	1,199,001
Mt. Baker N.F.	93,620	3,660,542	86,110	10,092,092	33,960	7,960,224	5,360	3,801,848	219,050	25,514,706
Okanogan N.F.	8,465	330,982	2,040	239,088	--	--	--	--	10,505	570,070
Olympic N.F.	70,190	2,744,429	48,700	5,707,640	15,000	3,516,000	3,900	2,766,270	137,790	14,734,339
Snoqualmie N.F.	134,065	5,241,942	67,265	7,883,458	10,965	2,570,196	840	595,812	213,135	16,291,408
Wenatchee N.F.	149,280	5,836,848	104,345	12,229,234	50,480	11,832,512	10,500	7,447,650	314,605	37,346,244
Mt. Rainier N.P.	21,335	834,199	9,240	1,082,928	5,440	1,275,136	640	453,952	36,655	3,646,215
Olympic N.P.	217,690	8,511,679	160,750	18,839,900	30,510	7,151,544	4,080	2,893,944	413,030	37,397,067
Spokane I.R.	240	9,384	--	--	--	--	--	--	240	9,384
Yakima I.R.	2,645	103,420	3,600	421,920	1,010	236,744	120	85,116	7,375	847,200
Quinault I.R.	36,040	1,409,164	6,440	754,768	530	124,232	600	452,580	43,610	2,740,744
Glenwood Dist.	760	29,716	560	65,632	--	--	--	--	1,320	95,348
Puget Sound Dist.	--	--	560	65,632	160	37,504	--	--	720	103,136
Northwest Wash. Dist.	2,060	80,546	140	16,408	--	--	--	--	2,200	96,954
Northeast Wash. Dist.	760	29,716	--	--	--	--	--	--	760	29,716
Sub-total	1,086,440	42,479,806	823,660	96,532,952	320,845	75,206,068	67,340	47,991,262	2,298,285	262,210,088
Regional Total	1,469,105	57,442,009	1,014,320	118,878,304	423,916	99,365,676	82,090	58,435,437	2,989,431	334,139,426

[1] Estimated average tree: 20 in. d.b.h.; 80 ft. tall; 500 bd. ft./tree.
[2] N.F., National Forest; N.P., National Park; I.R., Indian Reservation; Dist., State ownership.

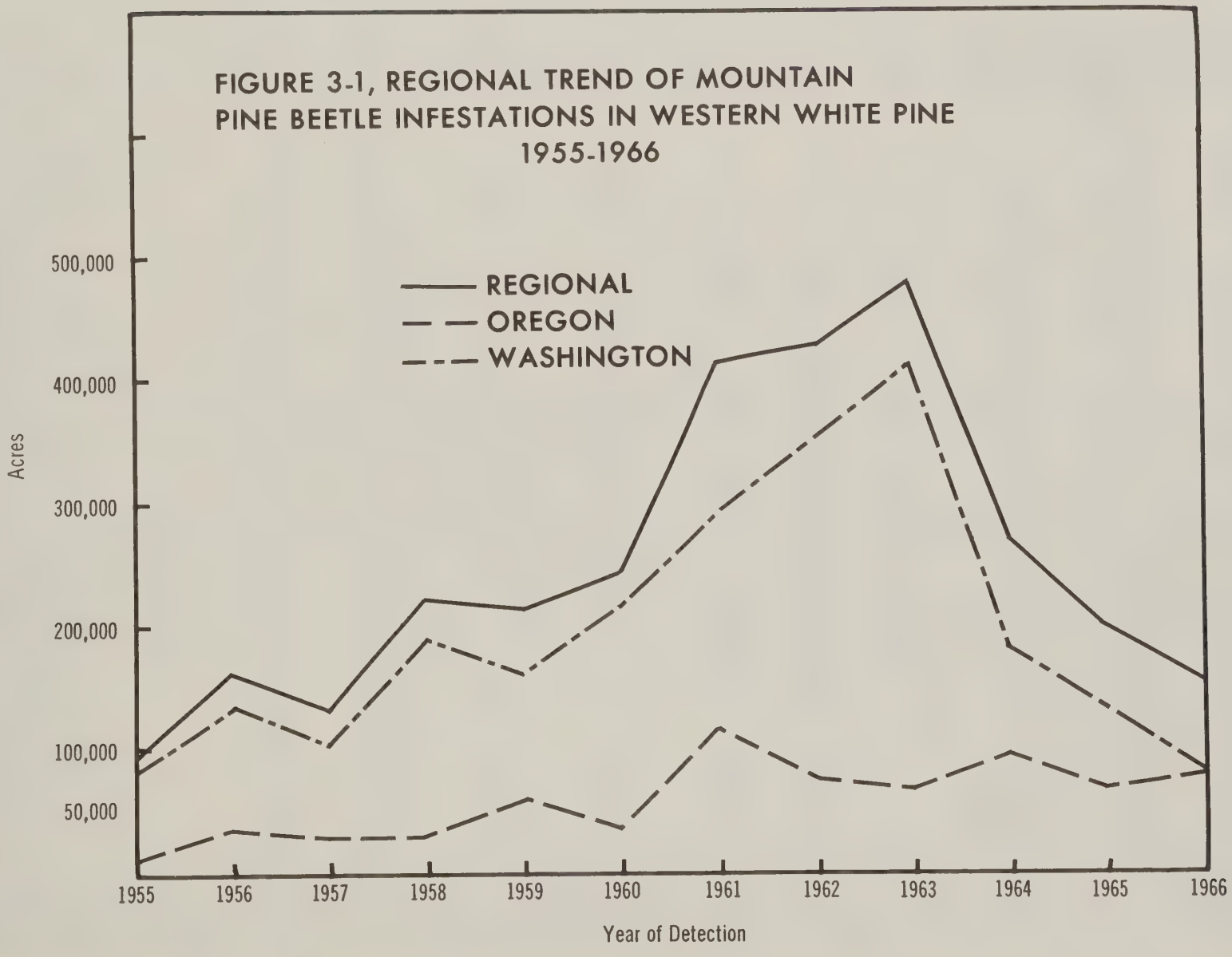
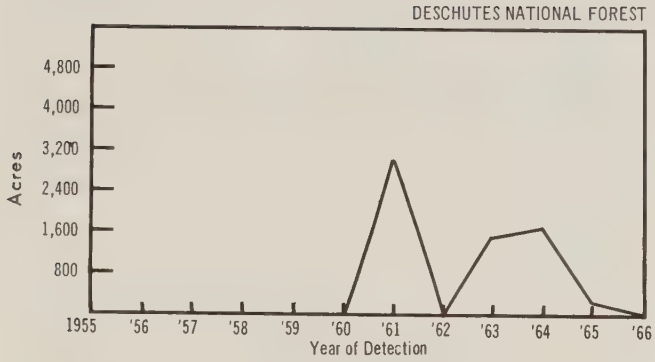
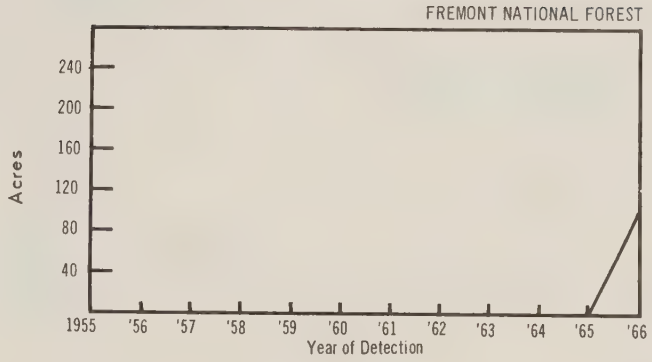
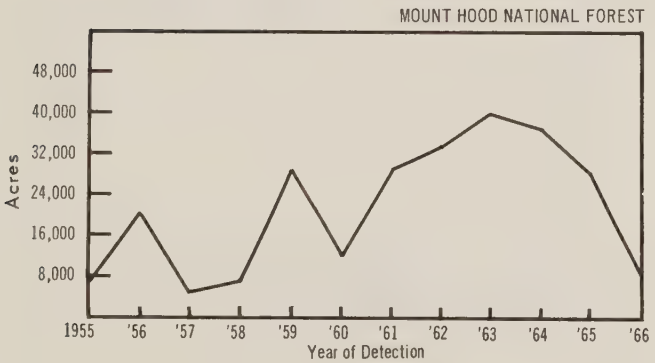


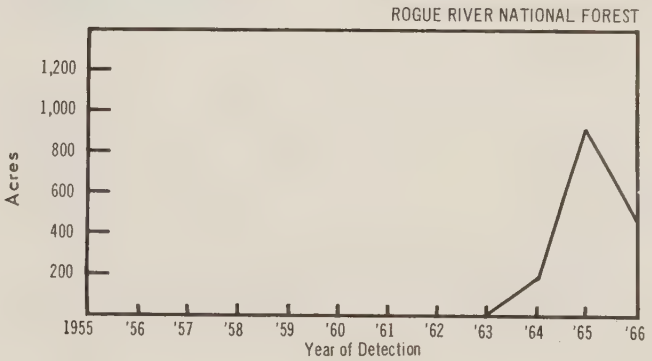
FIGURE 3-1, REGIONAL TREND OF MOUNTAIN
PINE BEETLE INFESTATIONS IN WESTERN WHITE PINE
1955-1966
REGIONAL
OREGON
WASHINGTON
500,000
400,000
300,000
200,000
100,000
50,000
Acres
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
Year of Detection

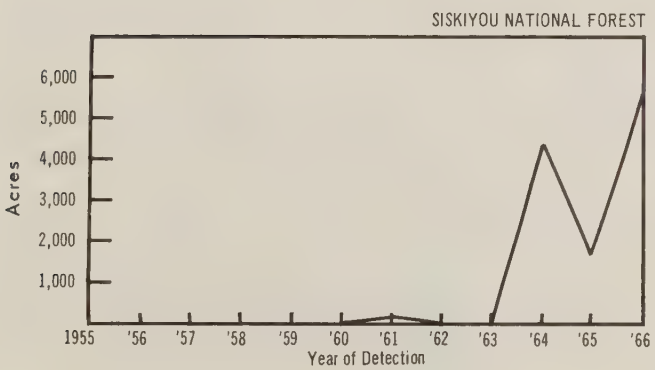
FIGURE 3-2, OREGON LANDS











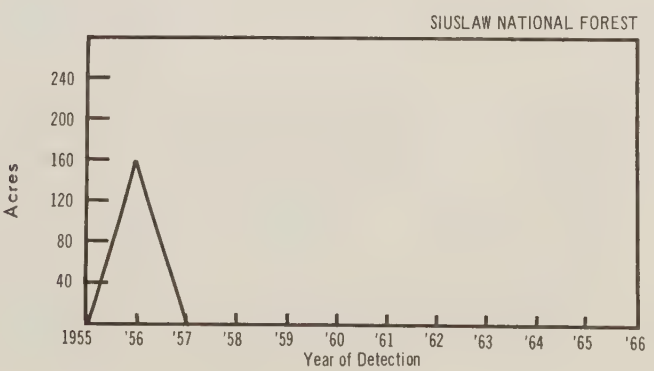
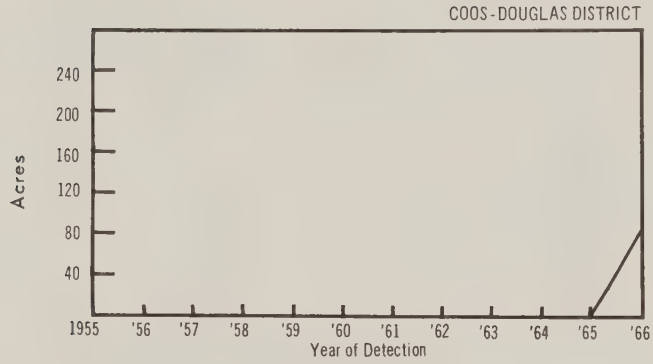
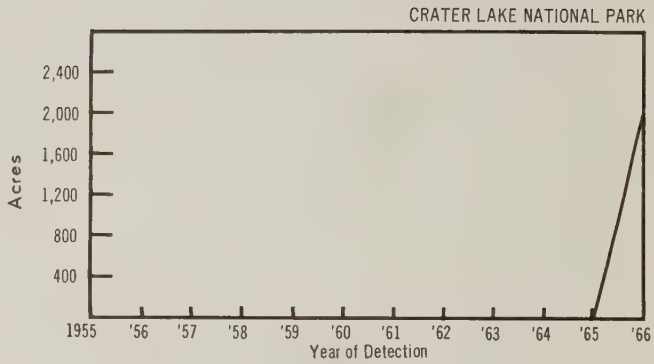
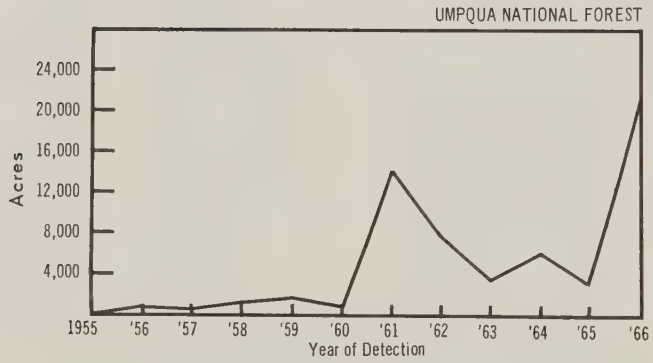
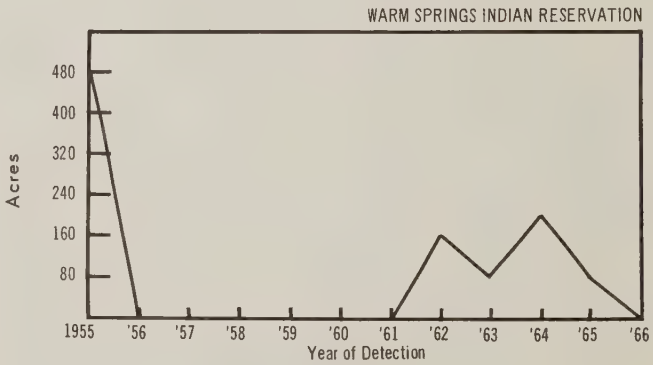


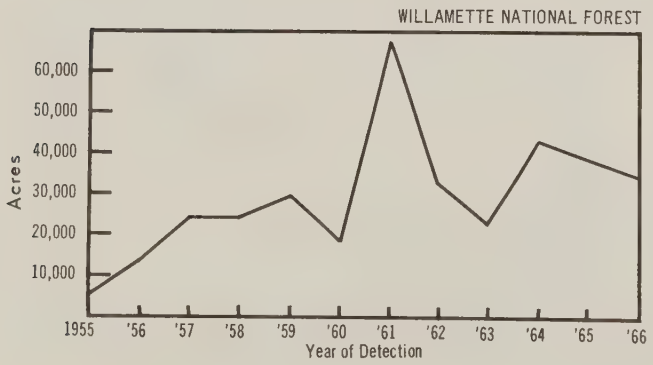
FIGURE 3-3, OREGON LANDS











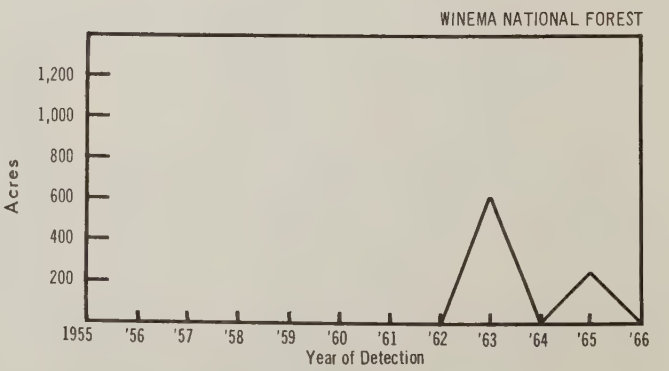
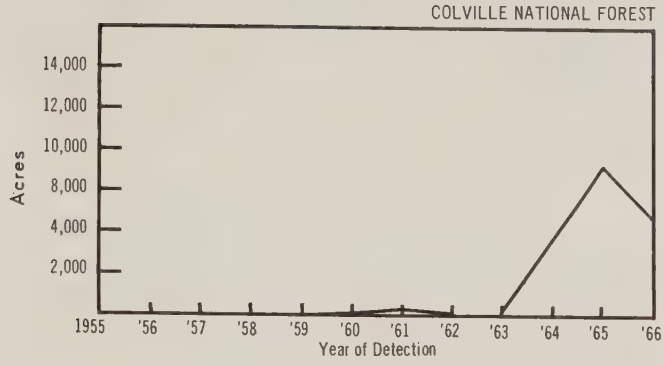
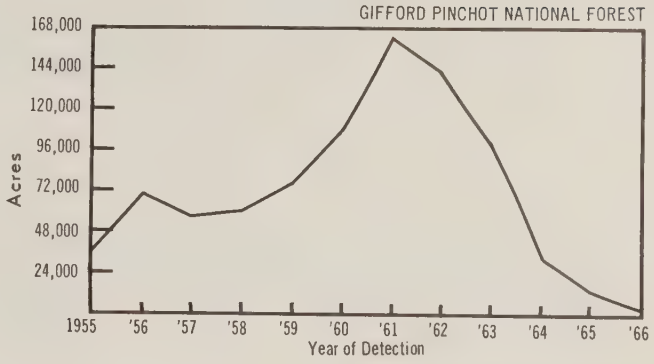
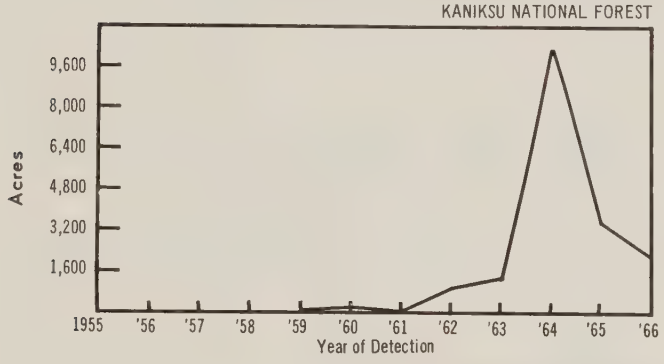
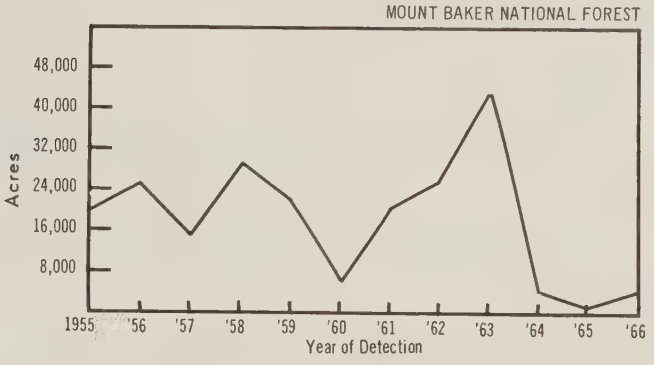


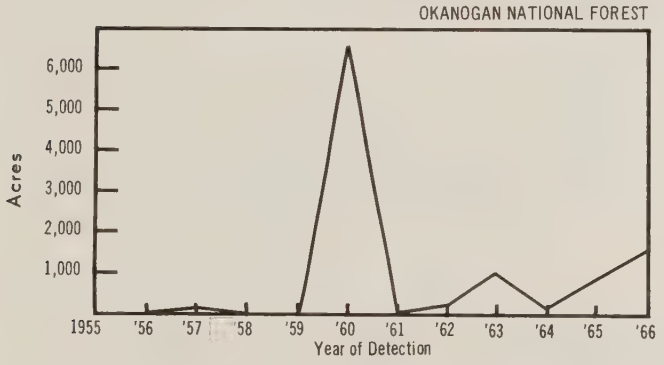
FIGURE 3-4, WASHINGTON LANDS

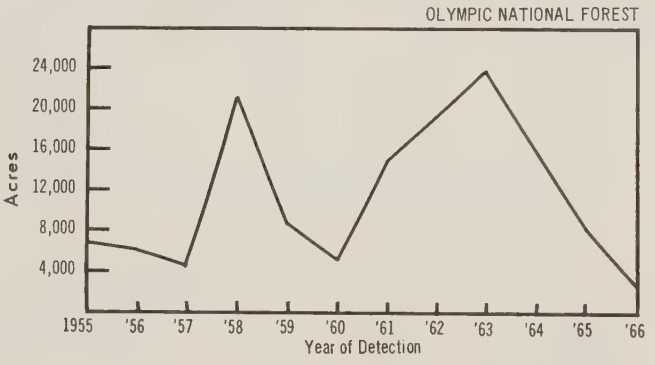


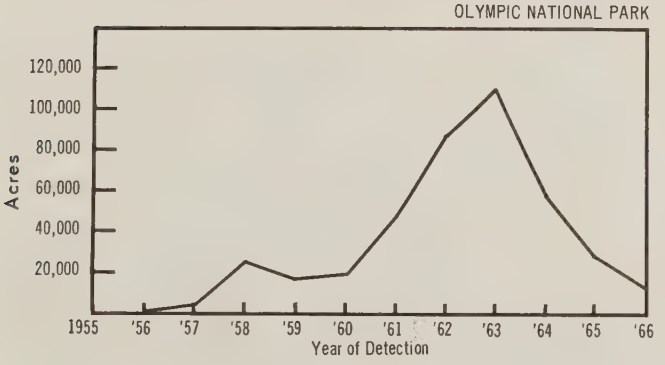


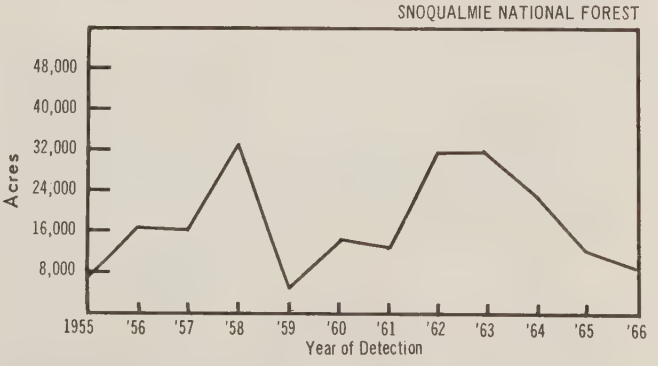












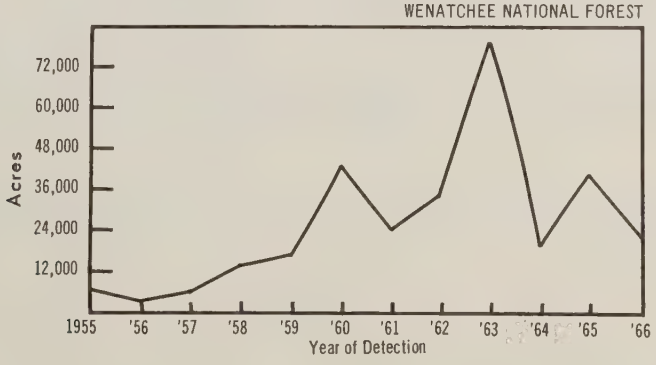
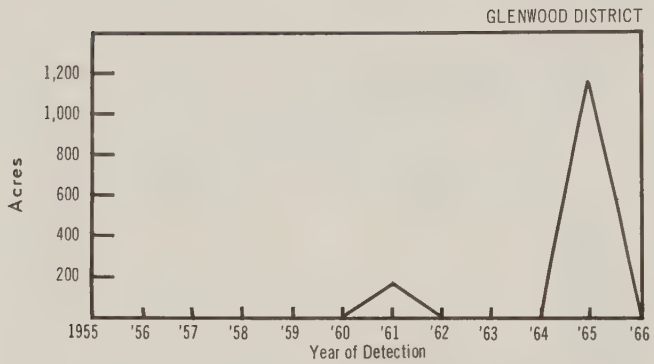
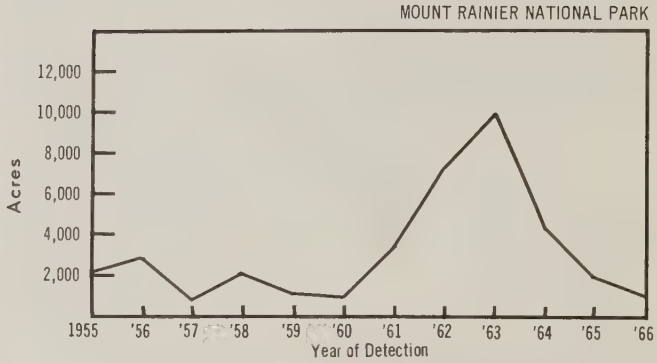
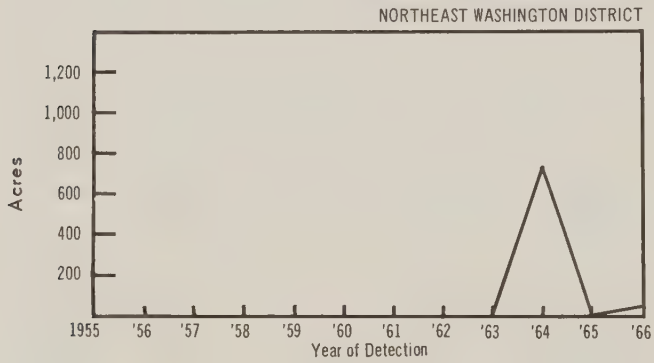
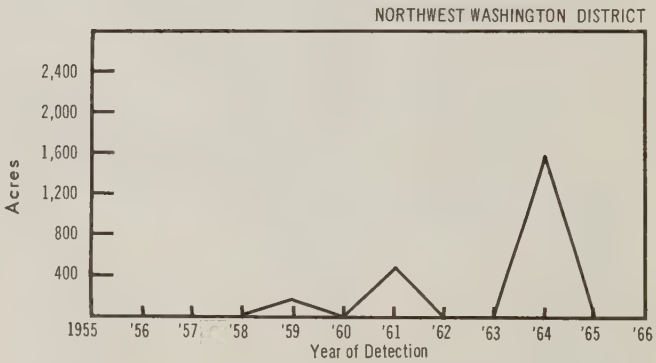


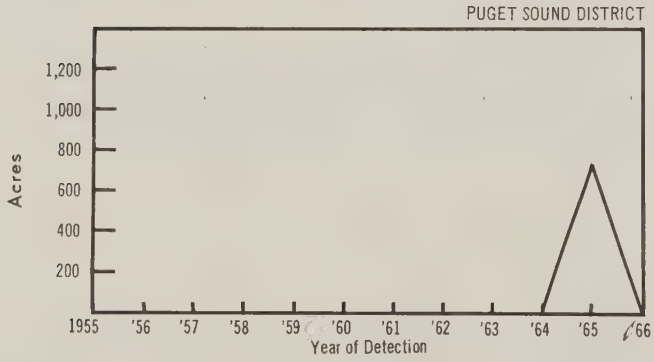
FIGURE 3-5, WASHINGTON LANDS

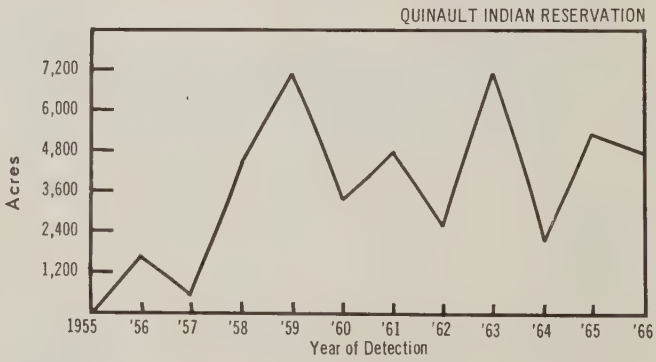


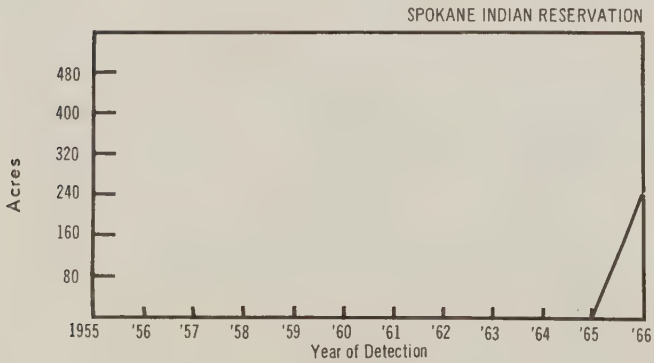


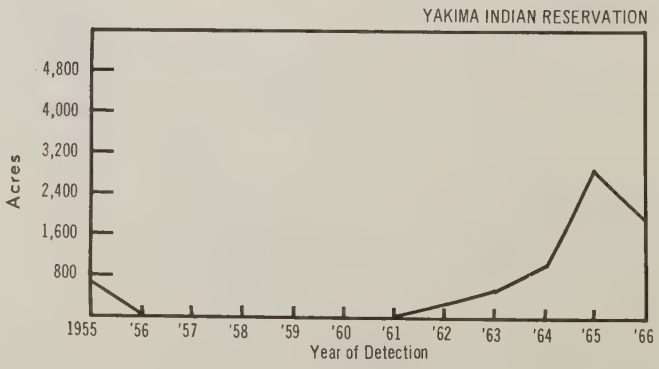












SUGAR PINE

History

Sugar pine stands are limited in the Northwest. Its range extends north from Baja, California, to Clackamas and Jefferson Counties in Oregon. No serious mountain pine beetle outbreak has occurred in the Pacific Northwest. Most of the damage has been endemic and the few outbreaks that occurred were short lived.

Damage Classification

The intensity classification used for mapping bark beetle damage in sugar pine stands during aerial detection surveys follows:

Infestation intensity	Trees per section	Trees per group	Estimated volume loss
	— — *Number* — —		*Bd. ft./acre*
Light	20-50	5 or less	49.6
Moderate	50-100	10 or less	186.3
Heavy	100-200	20 or less	0.0[1]
Very heavy	200 or more	20 and over	0.0

[1] Data not available for estimating board foot loss.

Location of Damage

The mountain pine beetle kills mature and overmature sugar pine each year. Generally losses are very light and never reported. During the period 1955-1966, tree killing was not reported for 6 different years (table 8). The estimated volume killed during this 12-year period was 148 MM board feet (table 9). Although epidemic losses were reported during the remaining 6 years, 95 percent of damage occurred after 1963 (figure 4-1). Most of the tree killing was in southwest Oregon on the Coos-Douglas District, Bureau of Land Management, and the Rogue River and Siskiyou National Forests (map 5, figure 4-2).

The sudden surge of tree killing reported in 1964 may be directly related to the 1962 October windstorm. This storm damaged many trees throughout southwest Oregon and these trees provided the ideal breeding site conducive to an epidemic. The damaged trees attracted the beetles during the summer of 1963 and faded in 1964. The beetle populations remained high during the 1964 flight, resulting in significant losses by 1965. Thereafter, healthy, green trees resisted beetle attacks and the population dwindled to an endemic level.

Control Measures

Since most of the mortality occurs in old-growth stands, logging is recommended to minimize timber losses. To be effective, all merchantable infested trees should be logged and removed from the woods before July 1.

Direct control in sugar pine stands has not been recommended in Oregon because of the prevalence of blister rust.

Table 8.—Trend of mountain pine beetle infestations in sugar pine in Oregon by reporting area 1955-66
(In Acres)

Reporting Area[1]	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total
Oregon:													
Deschutes N.F.	--	--	--	--	--	320	--	--	--	40	50	440	850
Fremont N.F.	--	--	--	--	--	--	--	--	--	--	1,640	--	1,640
Rogue River N.F.	--	--	160	--	--	120	--	160	--	490	130	1,200	2,260
Siskiyou N.F.	--	--	--	--	--	--	--	--	--	1,030	4,110	300	5,440
Umpqua N.F.	--	--	--	--	--	40	--	--	--	--	--	70	110
Winema N.F.	--	--	--	--	--	--	--	--	--	--	20	360	380
Coos-Douglas District	--	--	--	--	--	--	--	--	--	4,600	160	--	4,760
Total	0	0	160	0	0	480	0	160	0	6,160	6,110	2,370	15,440

[1] N.F., National Forest; District, State ownership.

Table 9.—Extent and estimated volume of sugar pine killed by the mountain pine beetle in Oregon by reporting unit 1955-66[1]

Reporting Area[2]	Light		Moderate		Heavy		Very Heavy		Total	
	Acres	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*	*Acres*	*Volume*
Oregon:										
Deschutes N.F.	530	26,880	320	59,616	--	--	--	--	850	86,496
Fremont N.F.	1,640	81,344	--	--	--	--	--	--	1,640	81,344
Rogue River N.F.	2,260	112,096	--	--	--	--	--	--	2,260	112,096
Siskiyou N.F.	5,080	251,968	360	67,068	--	--	--	--	5,440	319,036
Umpqua N.F.	110	5,456	--	--	--	--	--	--	110	5,456
Winema N.F.	380	18,848	--	--	--	--	--	--	380	18,848
Coos-Douglas District	240	11,904	4,520	842,076	--	--	--	--	4,760	853,980
Total	10,240	508,496	5,200	968,760	0	0	0	0	15,440	1,477,256

[1] Estimated average tree: 30 in. d.b.h.; 112 ft. tall; 1,590 bd. ft./tree.
[2] N.F., National Forest; District, State ownership.

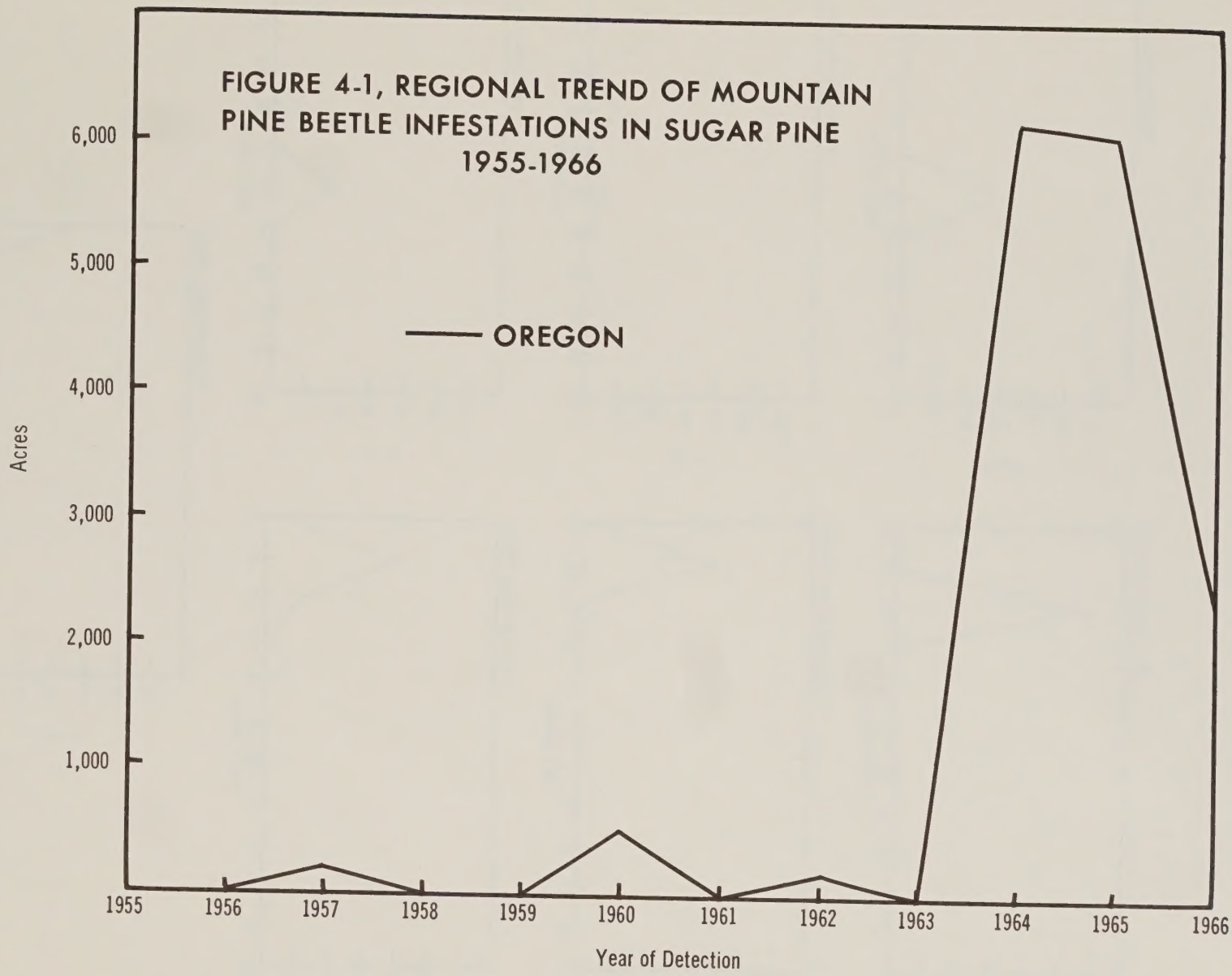
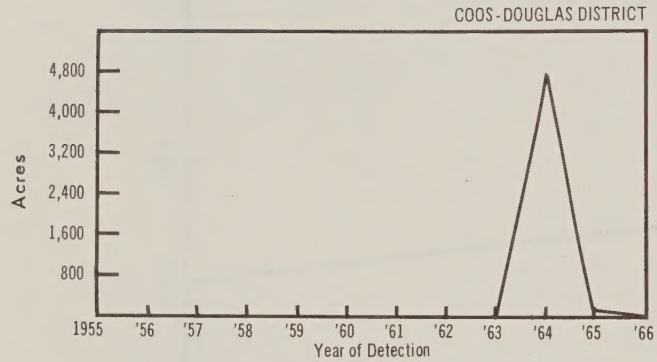
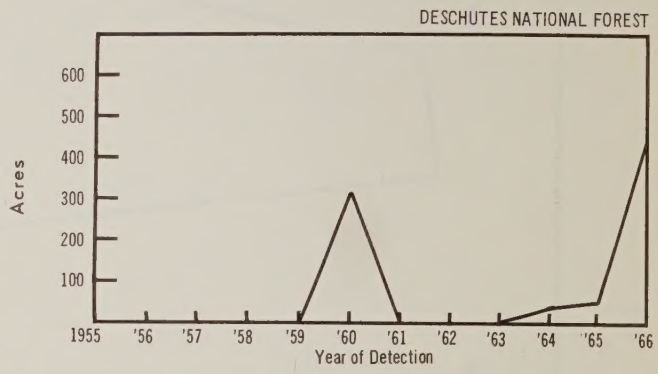
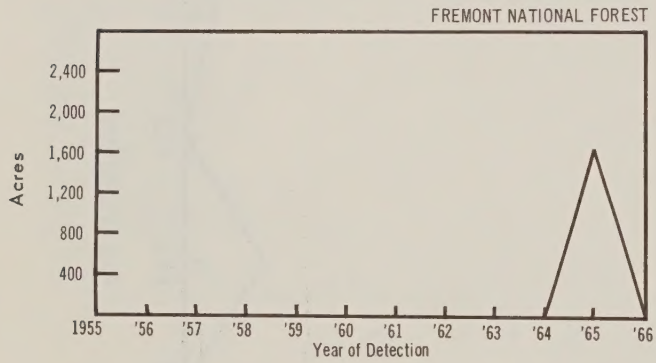


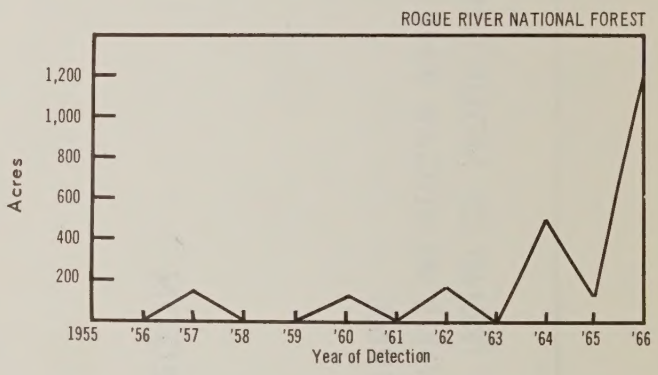
FIGURE 4-1, REGIONAL TREND OF MOUNTAIN PINE BEETLE INFESTATIONS IN SUGAR PINE 1955-1966
OREGON
Acres
6,000
5,000
4,000
3,000
2,000
1,000
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
Year of Detection

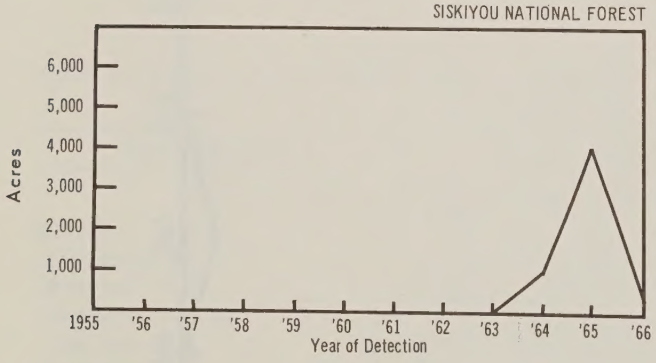
FIGURE 4-2, OREGON LANDS

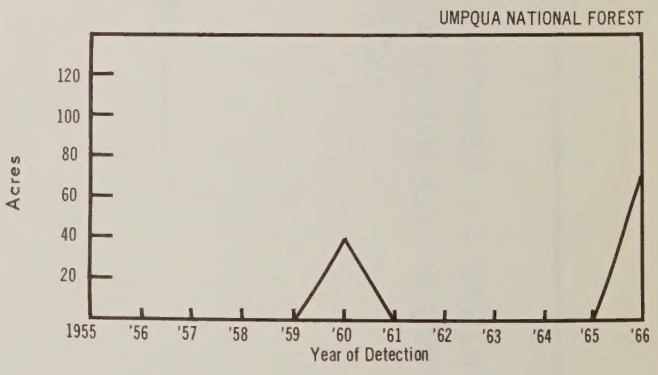


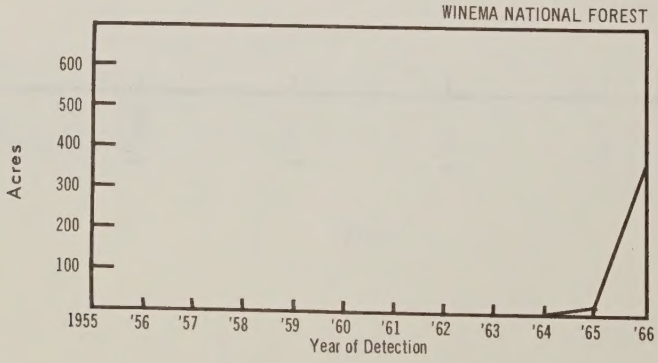


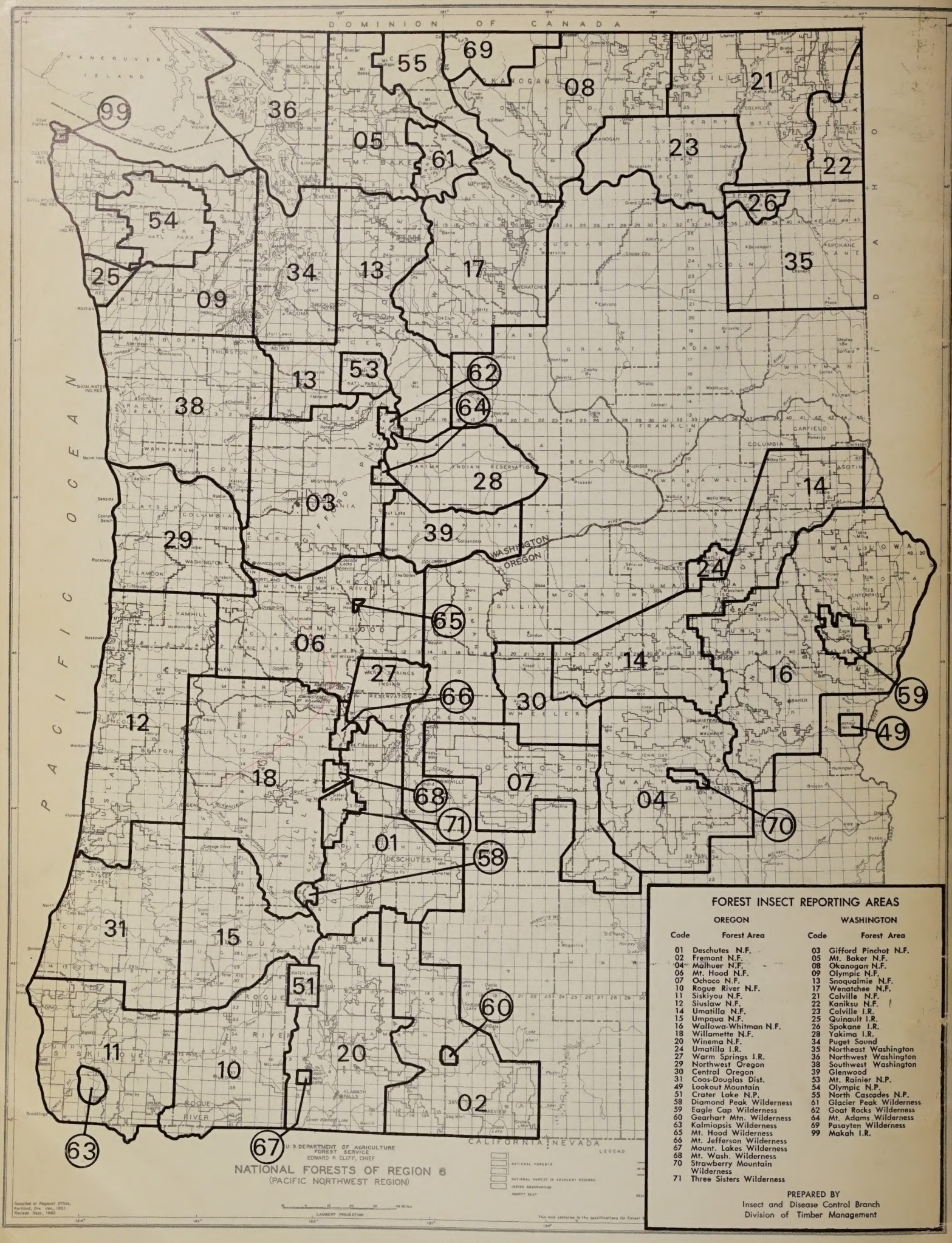











DOMINION OF CANADA
PACIFIC OCEAN
VANCOUVER ISLAND
CALIFORNIA NEVADA
IDAHO
WASHINGTON
OREGON
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02
63
67
FOREST INSECT REPORTING AREAS
OREGON
Code Forest Area
01 Deschutes N.F.
02 Fremont N.F.
04 Malheur N.F.
06 Mt. Hood N.F.
07 Ochoco N.F.
10 Rogue River N.F.
11 Siskiyou N.F.
12 Siuslaw N.F.
14 Umatilla N.F.
15 Umpqua N.F.
16 Wallowa-Whitman N.F.
18 Willamette N.F.
20 Winema N.F.
24 Umatilla I.R.
27 Warm Springs I.R.
29 Northwest Oregon
30 Central Oregon
31 Coos-Douglas Dist.
49 Lookout Mountain
51 Crater Lake N.P.
58 Diamond Peak Wilderness
59 Eagle Cap Wilderness
60 Gearhart Mtn. Wilderness
63 Kalmiopsis Wilderness
65 Mt. Hood Wilderness
66 Mt. Jefferson Wilderness
67 Mount. Lakes Wilderness
68 Mt. Wash. Wilderness
70 Strawberry Mountain Wilderness
71 Three Sisters Wilderness
WASHINGTON
Code Forest Area
03 Gifford Pinchot N.F.
05 Mt. Baker N.F.
08 Okanogan N.F.
09 Olympic N.F.
13 Snoqualmie N.F.
17 Wenatchee N.F.
21 Colville N.F.
22 Kaniksu N.F.
23 Colville I.R.
25 Quinault I.R.
26 Spokane I.R.
28 Yakima I.R.
34 Puget Sound
35 Northeast Washington
36 Northwest Washington
38 Southwest Washington
39 Glenwood
53 Mt. Rainier N.P.
54 Olympic N.P.
55 North Cascades N.P.
61 Glacier Peak Wilderness
62 Goat Rocks Wilderness
64 Mt. Adams Wilderness
69 Pasayten Wilderness
99 Makah I.R.
PREPARED BY
Insect and Disease Control Branch
Division of Timber Management
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
EDWARD P. CLIFF, CHIEF
NATIONAL FORESTS OF REGION 6
(PACIFIC NORTHWEST REGION)
LEGEND
NATIONAL FORESTS
NATIONAL FOREST IN ADJACENT REGIONS
INDIAN RESERVATION
COUNTY SEAT
Compiled at Regional Office, Portland, Ore. Jan., 1951
Revised Sept., 1952
LAMBERT PROJECTION
This map conforms to the specifications for Forest

GPO 998-890